M. Manley / Numériser

27/03/2004

BRAG 2004
Summary Talk

March 23, 2004
Grenoble

17 nonlocal participants
7 countries
3 continents

Two main sessions:

I. Model Dependence of EM Multipoles and Resonance Parameters

II. Extra Resonances in πN and (γ, π) Multipoles

D. Mark Manley
Kent State Univ.

Lothar Tiator – "Model Dependence of Nucleon Resonance Parameters for P_{11} (1440), D_{13} (1520), and S_{11} (1535)"

Problems :

- Need very precise PW amp's.
- Need to separate resonance & bkd.
- Need to Know precisely mass, width, & single π branching ratio

S_{11} (1535) $\rightarrow p\gamma$

Values of S_{11} photon decay amplitude diverged when more data became available ~1995. New SAID value gives very small γp amplitude.

Comparison w/ 3 methods for resonance – bkd. separation.

Results :

- Methods (b) and (c) are similar
- Most problematic case is S_{11}

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- Most soln's. could be fitted well w/ all 3 methods; only SAID soln. for S_{11} is better fitted by method (a)
- P_{11} soln's. are closer together than S_{11} but problem w/ P_{11} is the large uncertainty in the data.
- All analyses (but Bennhold (c)) give good agreement for D_{13} amplitudes

Conclusion: Method (a) is problematic & can mix bkg. & resonance. It is recommended that method (c) be used.

Simon Capstick – "Baryon Photocouplings and Baryon-Baryon-Meson Form Factors"

- Quark Model beginning w/ simple $O(P/m)$ Hamiltonian.
- Put together w/ NR model of baryon structure

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- Calculate decay amp's. w/ $O(P/m)^2$ relativistic-corrected transition operator
- Parameters of fundamental interest: M, Γ, partial widths, photocouplings

(Extraction from γN and πN data requires model of reaction dynamics)

Pion cloud causes differences between QM predictions & expt'l data. This happens not only for Δ(1232) but also for other resonances. The pion cloud contribution is important only at low Q^2.

Mauro Giannini – "EM Multipoles – Theory Issues"

Concentrate discussion on Q^2 dependence of helicity amplitudes.

Approximate potential between quarks by hypercentral potential:

$V = V(x)$:

$$\sum_{i<j} V(r_{ij}) \approx V(x) + \ldots$$

- Use $V(x) = ax - \frac{\tau}{x}$,
- add std. spin-spin 1-gluon-exchange term,
- Take $m = \frac{M}{3}$ { m = quark mass, M = nucleon mass
- Add isospin-dependent terms for further improvement

Results: $A_{\frac{1}{2}}^{p}(Q^2)$ reproduces data for $S_{11}(1535)$ very well.

Several longitudinal helicity amps. vanish in limit of SU(6) symmetry. Deviations from zero are due to configuration mixing.

Volker Burkert - "Electroexcitation of the $P_{33}(1232)$, $P_{11}(1440)$, $S_{11}(1535)$, and $D_{13}(1520)$ at $Q^2 = 0.4\,(GeV/c)^2$ from an analysis of CLAS Data"

Analyzed data at $W < 1.64$ GeV:

$p(e, e' p)\pi^0$
$p(e, e' n)\pi^+$
$p(\vec{e}, e' p)\pi^0$
$p(\vec{e}, e' n)\pi^+$
$p(e, e' p)\eta$

2 Analysis Methods

- Dispersion Relations
- Isobar Model

Complete data set avail. only for $Q^2 = 0.4$ and $Q^2 = 0.6$ $(GeV/c)^2$

not yet analyzed

Results: Magnitudes of all transuerse amplitudes agreed well using both methods; the two methods gave some small inconsistencies for the longitudinal amplitudes (e.g., for $P_{11}(1440)$ and $D_{13}(1520)$)

Bernard Metsch – "Amplitudes in a Bethe-Salpeter Method"

- Presented formalism, but no results.

Bill Briscoe – "iSAID: A Web-based Scientific Database for Nuclear and Particle Physics Data"

http://128.164.158.188/isaid/index.jsp

Please contact Bill Briscoe or Ron Workman w/ your suggestions!

Alfred Svarc – "The Presence of Extra P_{11} Resonances in the Zagreb Analysis since 1995"

- Zagreb Model based on CMU-LBL Formalism
- Input { $\pi N \to \pi N$ partial T-matrices; $\pi N \to \eta N$ data base

S_{11} – 3 poles

P_{11} { (a) 3 poles – PRC 51, 231 (1995); (b) 4 poles – Physica Scripta (1998)

3-resonance soln.

2 of the P_{11} resonances decay mainly to ηN, which is not considered physically acceptable. This soln. also inconsistent w/ ηN scattering length.

4-resonance soln.

2 of the 4 P_{11} resonances are nearly degenerate w/ masses near 1740 MeV!

Sasha Ceci - "The Development of the General Purpose Code (GPC) for the Resonance Analysis"

Inherent problem of CMB Models is the nontrivial relation between fitting and the resonance parameters.

- The method presented will simplify the CMB approach to allow resonance information to be extracted at intermediate stage in the fit.

- The extracted resonance info. may then be used to constrain the final resonance parameters.

Mark Manley – "P_{11} and S_{11} Resonances in Multichannel πN Scattering"

- Results presented for 1 fit of S_{11} waves and 2 fits of P_{11} waves
- Speed plot for S_{11} $\pi N \to \pi N$ amp. reveals 3 bumps for 3 resonances
- Speed plot for P_{11} $\pi N \to \pi N$ amp. reveals only 1 bump, for the Roper resonance
- $P_{11}(1710)$ described equally well as broad (368 ± 85 MeV) or very narrow (50 ± 44 MeV). Only its mass and small coupling to πN seem known w/ any certainty.
- Parameters for $P_{11}(1440)$ are robust.

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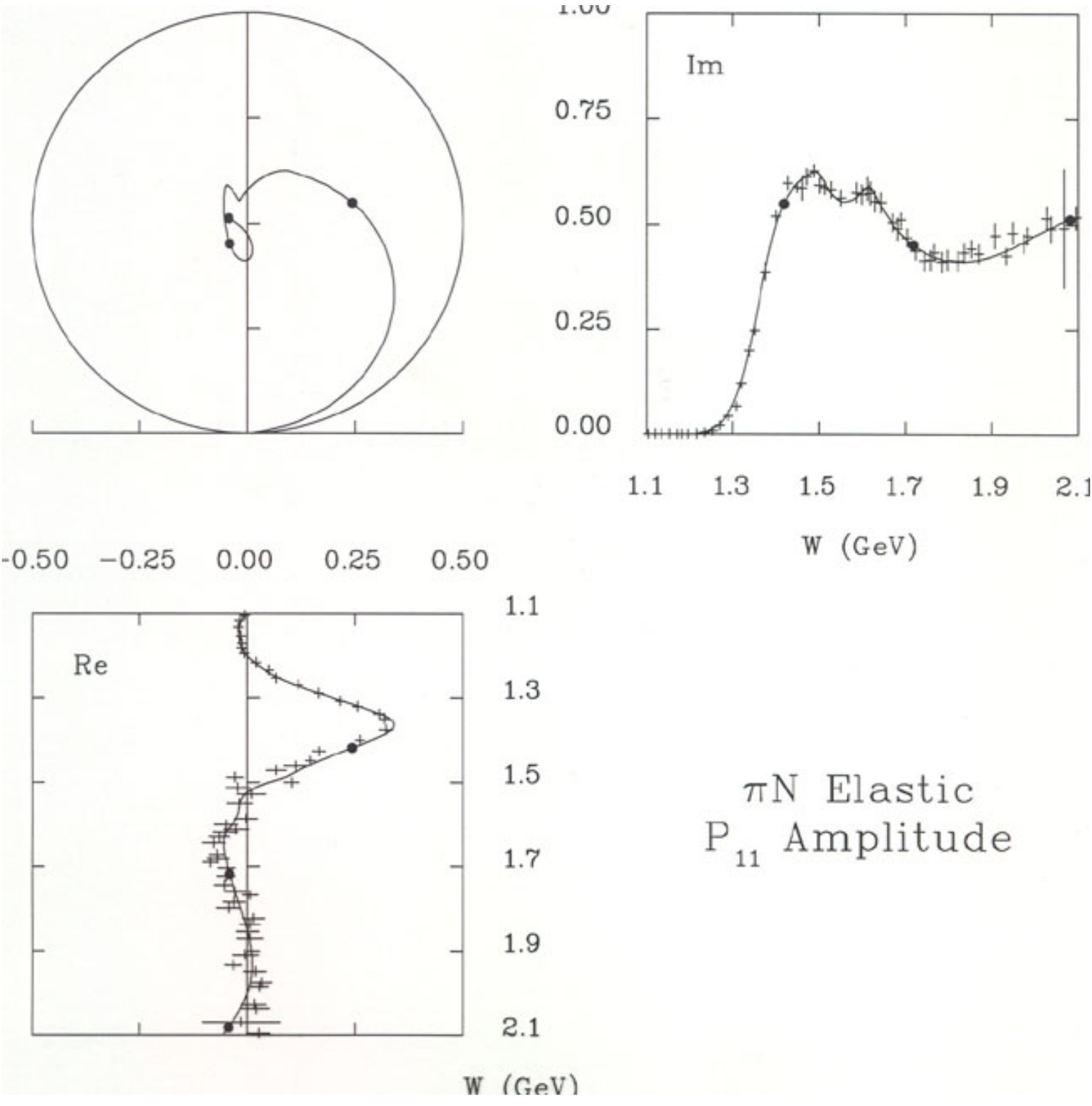

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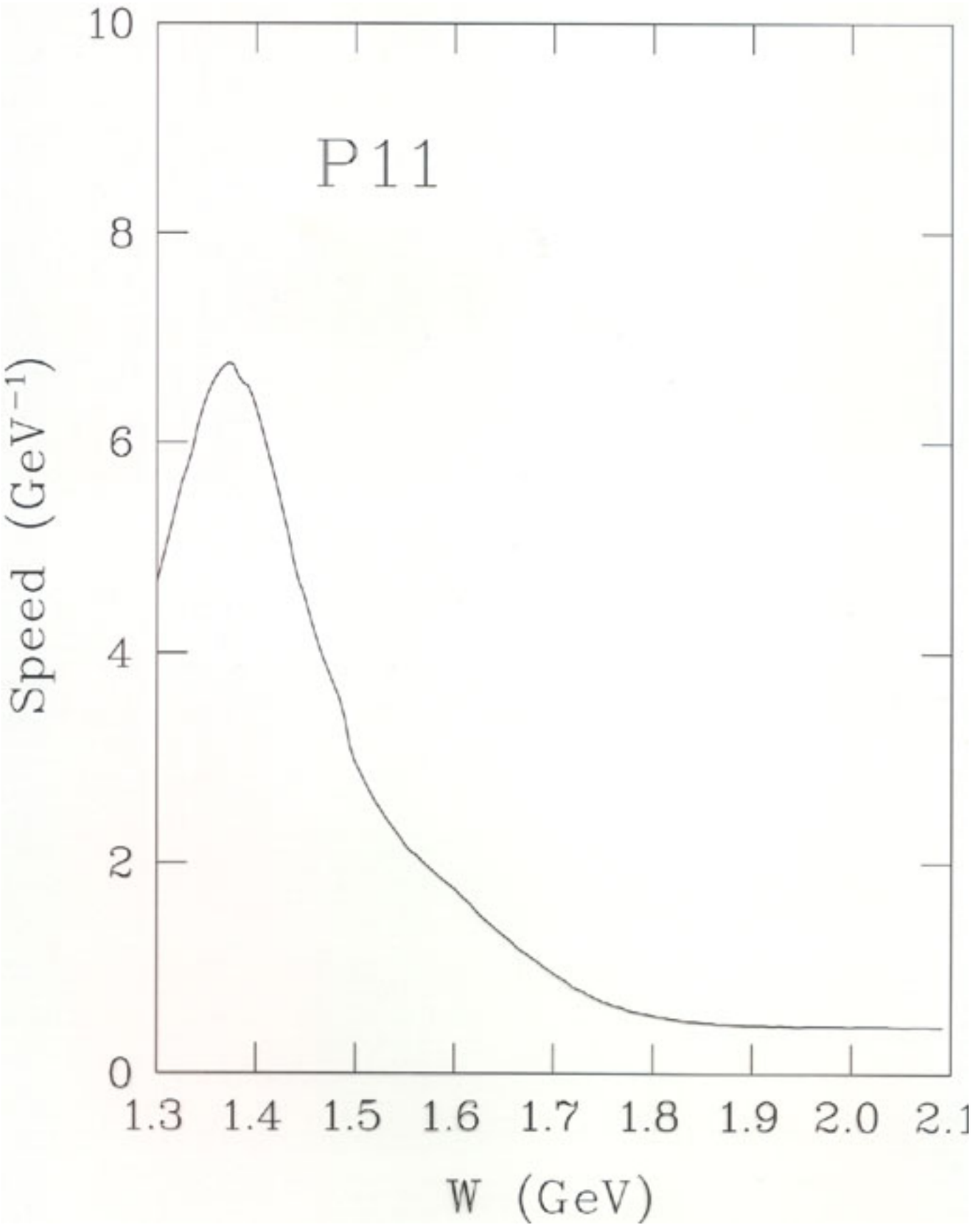

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