A BIBLIOGRAPHY AND SUMMARY OF DATA FOR THE 

\((p, \pi)\) REACTION: \(p + A \rightarrow \pi + (A+1)\)

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(p,π) REACTION: p + A → π + (A+1)

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INTRODUCTION

The exclusive pion production process on nuclei, \( p + A \rightarrow (A+1) + \pi \), has generated a lot of interest over the past few years and equally resulted in a large number of papers, both theoretical and experimental. In the course of preparing a review article\(^1\) on this subject it was necessary to compile an extensive bibliography of these papers. This bibliography contained a number of papers not referenced, and covered some areas not eventually included, in the review. Each entry also contained additional information, notably the title of the paper, which again could not be included in the review. For these reasons, and in view of the great interest in this field, it appeared useful to make the entire bibliography available separately as a laboratory report.

The list of references here thus contains all papers referred to in the review plus all those known to the author as of September, 1980 in the following areas. On the experimental side, all papers dealing with the reaction \( A(p,\pi)A+1 \) in the medium energy region (\( E_p \leq 800\text{ MeV} \)) are included with the exception of some very early ones, mainly dealing with \( pp \rightarrow \pi d \), which are represented by later data surveys. The reversed reactions \( A+1(\pi,p)A \) are included equally, except that reactions with stopped pions have been excluded. Theoretical papers dealing with \( (p,\pi) \) reactions in all of the various models have been included for \( A \geq 2 \), as have papers dealing with various related topics, eg. the question of the pion-nucleon vertex function. The specific reactions \( pp \rightarrow \pi d \) and \( NN \rightarrow NN\pi \) were not covered in the review and hence theoretical papers on these reactions are represented rather sketchily in the bibliography. It was intended however that most of the very recent articles (and a few older ones) be included so that the interested reader can trace for himself the earlier papers.

The references are listed alphabetically and chronologically by the first two letters of the first author's name plus the date of publication. A simplified subject index has been included, to provide at least some classification into subject areas.

Finally included at the end is a table, taken from the review,\(^1\) listing target nuclei, energy, and angular range for all \( (p,\pi) \) and \( (\pi,p) \) data available, and indicating the appropriate reference from the bibliography.

The author would appreciate being informed of errors and omissions and of papers in the field published subsequent to September 1980, as it may be possible to provide an addendum to this listing at some time in the future.

\(^1\)Harold W. Fearing in Progress in Particle and Nuclear Physics, ed. by D. Wilkinson (to be published)

** The Reaction $^2$H(p,t)$\pi^+$ at 470 and 500 MeV


** Measurements of $p + p \rightarrow \pi^+ + d$ Between 398 MeV and 572 MeV


** The Reaction $p + p \rightarrow \pi^+ + d$ Between 1.0 and 1.5 GeV/c


** Calculation of the Pion Production Reaction $^3$He(p,$\pi^+$)$^4$He


** Field-Theory Treatment of the $p + p \rightarrow d + \pi^+$ Reaction


** Pion Nucleus Charge Exchange Reactions


** Calculation of the Cross Section of the Reaction $p + A \rightarrow \pi^+ + (A + 1)$ in the Single-Particle Model


** Cross Sections for (pi+,p) Reactions on $^6$Li, $^9$Be, $^{12}$C, $^{16}$O


** Constraints on the High Momentum Behavior of Inelastic Scattering Amplitudes


** Comparison of the Reactions $^{12}$C($\pi^+, p$)$^{11}$C and $^{12}$C(p,$\bar{d}$)$^{11}$C near the Same Momentum Transfer
** The $(\pi^+, p)$ Reaction on $^{12}$C and $^{13}$C Near 90 and 180 MeV

** The $^{12}$C and $^{13}$C$(\pi^+, p)$ Reaction at Pion Energy of 90 and 180 MeV

** Study of the Reaction $pp \rightarrow d\pi^+$ with a Polarized Beam and Target

** Relativistic Optical Model Analysis of Medium Energy $p-^4$He Elastic Scattering Experiments

** Relativistic Nucleon-Nucleus Optical Model

** Pion Absorption and Production Experiments

** Study of the Reaction $d(p,\pi^+)t$ at 410, 605, and 809 MeV

** Production of Positive Pions from the Bombardment of $^9$Be and $^{12}$C with 200 MeV Polarized Protons

** Differential Cross Section and Analyzing Power for Backward Pions in $d(p,\pi^+)t$
E. G. Auld, Proceedings of the Fifth Int. Symposium on Polarization Phenomena in Nuclear Reactions, Santa Fe, August 1980
** Polarization Analyzing Power Measurements in Coherent Pion Production by Protons

** New Approach to the Theory of Coupled piNN-NN Systems (I) Practical Equations and Unitarity

** The Interaction Between Positive Pions and Deuterons at 47.5 MeV

** Ambiguity of the "Galilean-Invariant" Operator for Pion Absorption by Nuclei

** Experimental Test of Charge Independence in n + p --> d + pi^0

** Nonrelativistic Hard-Pion Production and Current-Field Algebra

G. W. Barry, Phys. Rev. D 7, 1441 (1973)
** Nuclear Reactions at High Energy

** A Study of the Reactions d + p --> ^3He + pi^0 and d + p --> ^3He + eta

** Angular Distribution of the Reaction ^15C(pi^+,p)^15O at 66 MeV

** Nonrelativistic Hard-Pion Production and Current-Field Algebra. II. Reactions with Composite Targets

** Excitation of p-3/2 and p-1/2 Hole States in the $^{160}(\pi^+,p)^{150}$ Reaction at 66 MeV

** Study of the $^6$Li$(p,\pi^+)7$Li Reaction at 600 MeV

** Angular Momentum Selection Rule and $^9$Be$(p,\pi^+)8$Be Reaction at 50 MeV

** Positive Pion Production by 160 MeV Protons on $^{90}$Zr and $^{208}$Pb

** The $(p,\pi^+)$ Reaction Near Threshold

** Recent Developments in $(p,\pi)$

** $(p,\pi^+)$ Reaction on $^3$He, $^6$Li, $^{90}$Zr, $^{208}$Pb at Proton Energies 144-200 MeV and $(p,\pi^-)$ Reaction on $^{25}$Mg and $^{26}$Mg at Proton Energy 160 MeV

** Influence of Interactions in Intermediate NN\pi States on NN Scattering and $\pi + d \rightarrow p + p$

** A Phenomenological Hamiltonian for Pions, Nucleons, and Isobars

** Pion Production in the Reaction $p + d \rightarrow t + \pi$

** Models for Pion Production by Protons in Light Nuclei: pd $\rightarrow$ t$\pi^+$ at Medium Energies
[Bh77a] V. S. Bhasin, Phys. Lett. 69E, 297 (1977)
** Pion Production on $^3$He by Protons in the Energy Range 300 to 400 MeV

** Models for (p,pi) Reactions

** Hard Core Interpretation of the Reaction $p + d \rightarrow \pi^+ + t$

** Electroproduction and Photoproduction of Charged Pions on $^{27}$Al and $^{51}$V at Intermediate Energies

** Meson Production in $p + d$ Collisions and the I=0 $\pi$-$\pi$ Interaction. II. Study of the Reactions $p + d \rightarrow ^3$He + $\pi^0$ and $p + d \rightarrow ^3$H + $\pi^+$

** Galilean-Invariance Ambiguity in the Nonrelativistic Pion-Nucleon Absorption Operator

** (3,3) Resonance and Nucleon Pole Model for $p + p \rightarrow p + p + \pi^0$ and $p + p \rightarrow p + n + \pi^+$

** Heuristic Hamiltonian for Fermions Interacting via Meson Fields

** $\pi NN$ Vertex Operator and $\pi N$ Scattering

** Analysis of the $(p,\pi^+)$ and the $(d,p)$ Stripping Reaction

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** Coherent Description of Stripping Reactions at Energies Above the (3,3) Resonance

** Relativistic Effects in a $\pi$-Nucleon Model for Proton Induced Pion Production

** Pionic Disintegration of the Deuteron

** Relativistic Hartree-Fock Description of Nuclei

** Scattering and Reaction Cross Sections Measured at SPEP I

** A Study of the Reaction \( p + d \rightarrow ^3\text{He} + \pi^0 \) in the Resonance Region

** Role of the Small Components of the Nucleon-Nucleus Distorted Wave in \((p, \pi)\) Reactions

** Orthogonality Constraints and Proton-Induced Reactions

** The Production of \(^3\text{He}\) from Deuteron Interactions at 650 MeV

** Foldy Transformation in the \(\pi\)-Nucleus Interaction

** Effective Interaction for Pion Absorption and Production by Two Nucleons at Low Energies

** On the Reactions \( pp \rightarrow d\pi^+ \)

** Effects of Meson Exchange Currents on Pion Absorption

** Differential Cross Sections for Pion Production in the \( p + p \rightarrow \pi^+ + d \) Reaction Between 500 and 600 MeV

** Study of the Reactions \( ^9 \text{Be}(p,\pi^-)^{10}\text{C} \) and \( ^{12}\text{C}(p,\pi^-)^{13}\text{O} \) at 613 MeV

** A Simple Model for Pion Production

** Charge Independence in the Reactions \( p + d \rightarrow \pi^0 + ^3\text{He} \) and \( p + d \rightarrow \pi^+ + ^3\text{H} \) at 450 MeV

** Positive Pion Production in Nuclear Reactions Induced by 185 MeV Protons

** An Experimental Study of the \( ^9\text{Be}(p,\pi^+)^{10}\text{Be} \) and \( ^9\text{Be}(p,\pi^-)^{10}\text{C} \) Reactions at 185 MeV

** Positive Pion Production on \( ^{12}\text{C} \) by 185 MeV Protons

** Pion Production on Nuclei at 185 MeV

** Pion Production on \( ^{13}\text{C} \) by 185 MeV Protons

** Pion Production on \( ^{10}\text{Be} \) by 185 MeV Protons

** Positive Pion Production on \( ^{16}\text{O}, ^{28}\text{Si} \) and \( ^{40}\text{Ca} \) by 185 MeV Protons

** Microscopic Description of Nuclear \( \pi^+ \) Production in \( ^{12}\text{C} \)


** Consistent Analysis of the Production and Absorption of Pions near Threshold

** Proton Induced Production of Negative Pions on $^9$Be

** Note on the Nonrelativistic piN Interaction

** Proton Induced $\pi^-$ Production near Threshold

** Nuclear Pion Production as a Direct Reaction

** Models for Proton Induced Pion Production

** Nonstatic Effects in High-Momentum Transfer Reactions

** Analysis of the (p,$\pi^+$) Reaction at a Momentum Transfer Below 600 MeV/c

** Investigation of Deuteron-Induced Pion Production Near Threshold

** Finite Range Effects in the $\pi$-$N$-$N$, $\pi$-$N$-$\Delta$, and $\pi$-$\Delta$-$\Delta$ Vertices

** The (p,$\pi^+$) Reaction on $^9$Be and $^{10}$B at Intermediate Energies and a Coherent Pi-Exchange Analysis
** Theoretical Aspects of Proton Induced Exclusive Fission and Photoproduction on Nuclei

** Polarization and Differential Cross Section for the Reaction \( p + p \rightarrow d + \pi^+ \) at 425 MeV

** Observation of Structure in the Spectrum of Pions Produced by Fermi Motion

** Two-Body Pion Production \( d(p,\pi^+)t \) at 470 and 590 MeV

** Pion Absorption Processes

** (3,3) Resonance and Nucleon Pole for \( NN \rightarrow NN\pi \) at Low and Moderate Energy

** The \( \pi NN \) Vertex Function

** pd \( \rightarrow nd\pi^+ \) Reaction Mechanisms

** Soft Pion Production in the Reaction \( NN \rightarrow NN\pi \)

** Pion Production by 600 MeV Protons on Light Nuclei

** The \( (p,\pi^+) \) Reaction and Nuclear Structure

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** Consequences of Nuclear Dynamics for the Nonrelativistic piNN Vertex

** Orthogonality in Medium Energy Nuclear Reactions

** Pionic Atoms from Inside Cut: Direct Production in (p,pi-) Reactions

** Dispersion Relation Calculation of the piNN Form Factor for One Off-Shell Nucleon

** Distorted Wave Impulse Approximation Calculation of pd --> tpi+

** General Formalism for Pion Production in Nuclei: Application to pd --> tpi+

** Effect of the Deuteron D State on Distorted-Wave Impulse-Approximation Calculations of (p,pi) Reactions

** Distorted-Wave Impulse-Approximation (p,pi) Calculations: Effects of Realistic Wave Functions and Factors Determining Resonance Position

** Comparison of (p,pi) and (p,gamma) Reactions: p + d --> ^3He + gamma

** Angular Distribution and Yield of the Process p + d --> t + pi+

** An Experimental Study of the Reaction p + d --> ^3He + pi^0 in the Delta(1236) Resonance Region

** Pion-Nucleon Absorption Operator Ambiguity
** Equivalence Theorem and Relativistic Potential Models for Pion Absorption and Production

** The Reaction nd \( \rightarrow \) \(^3\)He(p\(,\)pi\(^\pm\)) at Backward Pion Angles from 400 to 580 MeV

** The pd \( \rightarrow \) tpi\(^\pm\)(Theta-pi=180) and pt \( \rightarrow \) tp(Theta-p=180) Excitation Functions in Terms of the pi\(^\pm\)d \( \rightarrow \) dpi\(^\pm\) Backward Elastic Scattering

** Pion Production in the Reactions d(p,pi\(^\pm\))t, \(^3\)He(p,pi\(^\pm\))t, \(^4\)He(p,pi\(^\pm\))t and \(^4\)He(p,pi\(^\pm\))t

** A Model for Estimating (p,pi\(^\pm\)) Cross Sections

** The Physics of Low Energy Pion Production

** A Study of the Two Nucleon Mechanism for Pion Production

** Coherent Pion Production from Nuclei at Threshold

** Study of the Reaction N + N \( \rightarrow \) pi + d at Threshold

** Off-Shell Effects in Pion-Deuteron Absorption

** Pi-Meson Absorption on the Deuteron

** Nuclear Single Pion Production near Threshold

** p + p → d + π⁺ p-Wave Production

** P-Wave Meson Production in p + p → d + π⁺

** The Effect of the Delta(1236) on the Imaginary Component of Nucleon-Nucleon Phase Shifts

** A Microscopic Model for the pd → tπ⁺ Reaction

** Pion Production in pp and pd Scattering Below 750 MeV

** An Isobar Model for the pd → tπ⁺ Reaction

** Non-Relativistic Approximations to the Pion Production Operator in ⁴He(p,nπ⁺)⁴He

** The Reaction nd → ³Heπ⁺ at Backward Pion Angles from 400 to 580 MeV

** Experiment on Charge Independence in Interactions of Nucleons and Pions

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** \( \pi^+ \) Production in Al and C by 209 MeV Polarized Protons

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** Single Pion Production in Proton-Deuteron Collisions

** Application of the Isobar Doorway Model to the \((\pi^+, p)\) Reaction in the (3,3) Resonance Region

** Theoretical Analysis of Positive Pion Production on \( ^{12}\text{C} \) by 185 MeV Protons

** Galilean Invariance of the Pion-Nucleon Interaction

** Pion Production and Absorption

** The \((p, \pi)\) Reaction on \( ^{26}\text{Mg} \) at 180 MeV and a Search for Delta** Components in Nuclei

** Positive Pion Production on \( ^{90}\text{Zr} \) and \( ^{208}\text{Pb} \) by 180 MeV Protons

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** The (p,pi^+->) Reactions on ^9Be at 800 MeV

** Recent Results from the (p,pi) and (pi,p) Reactions

** The (p,pi^+->) Reactions on ^12C and ^13C at 200 MeV

** Differential Cross Section for Pion Production in the Reaction p + p \rightarrow pi + d Between 500 and 600 MeV

** Production of the Delta^{++} in the Reaction p + p \rightarrow p + n + pi^+ at 800 MeV

** Angular Distribution of the Reaction n + p \rightarrow d + pi^0
** Pion Production and Bound Nuclei

** Pion Production in p + d -> pi + t Reaction

** Pion Absorption in 3He

** Comparison of (d,p) and (p,pi+) Reactions on 28Si at Similar Momentum Transfer

** Angular Distribution for the n + p -> d + pi0 Reaction

** Positive Pion Reactions with 12C

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** Nucleon Induced Experiments above the Pion Production Threshold

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** Reactions 3He(pi-,n)2H and 4He(pi-,n)3H at Pion Energies of 100, 200, and 290 MeV

** The (pi,p) Reaction in 6Li and 7Li at 75 and 175
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MeV

** Phenomenological Analysis of p + p \rightarrow pi^+ + d in
the Energy Range between 400 MeV and 800 MeV and
Di-Proton Resonances

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Between 400 MeV and 800 MeV

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** Pion Production by 185-MeV Protons

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** The Isobar Doorway Theory for Pion Nucleus Interactions

** Projection Operator Treatment of the \((\pi^+,p)\) Reaction

** An Improved Treatment of the \((p,\pi)\) Reaction

** Pion Production in Nucleon-Nucleon Scattering

** Nucleon-Nucleon Dynamics at Medium Energies (I) Unitary Model for Elastic and Inelastic Scattering

** Nucleon-Nucleon Dynamics at Medium Energies (III) I=1 Spin Dependent Total Cross Sections


** Production of Positive Pions by Neutron-Proton Collisions

** Production and Absorption of S-Wave Pions at Low Energy by Two Nucleons

** An Overview of Absorption and Production of Mesons

** Pion Absorption by Nuclei

** Positive Pion Production in Proton-Nucleus Collision

** Off-Shell Behavior of Pion Optical Potential and (p,pi+) Reactions

** Analyzing Power in Pion Production Reaction on $^{12}$C by 200 MeV Protons

** Absorption of Positive Pions by Deuterons

** Absorptive Separable Potentials Constructed from pIN Data

** Elements of the Theory of the $^{13}$C(pip+,pio)$^{13}$N Reaction

** Single-Nucleon Emission Following the Absorption of Free Pions
** Positive Pion Production at Threshold on a $^{10}$B Target

** $(p,\pi^+)$ Reactions at Threshold: Experimental Values of the Cross Measurements at $E=154$ MeV

** Pion Production near Threshold on $^{40}$Ca: Energy Dependence and Angular Distribution

** Positive and Negative Pion Production Near Threshold

** The Influence of Ambiguities in the Pion Production Operator on $(\pi,\pi^+)$ Cross Sections

** Single Pion Production in Proton Nucleus Collisions

** Pion Production in Two-Body $pd$ Collisions

** Pion Production in the Reaction $d(pd,\pi)n$ at 800 MeV with a Spectator Neutron

** New Aspects of the TRIUMF $(\pi,\pi)$ Program

** Reaction $p + p \rightarrow \pi^+ + d$ with Polarized Protons
** Total \((p,\pi^+)^{-}\) Cross Sections on Light Nuclei near the Pion Coulomb Barrier

** Inclusive \((p,\pi^+)^{-}\) Cross Sections Near Threshold

** Inclusive \((p,\pi^+)^{-}\) Cross Sections Near Threshold

** Intermediate Energy Pion Production

** Meson Baryon Dynamics and the \(p + p \rightarrow \pi^+ + d\) Reaction: I Total and Differential Cross Sections

** Meson Baryon Dynamics and the \(p + p \rightarrow \pi^+ + d\) Reaction: II Polarization Parameters

** Differential Cross Section for \(p + p \rightarrow \pi^+ + d\)

** Hopes and Realities for the \((p,\pi)^{-}\) Reaction

** Positive Pion Production by 185 MeV Protons

** The Use of "New" Pion Optical Potentials in the \((p,\pi^+)\) and \((\pi^+,p)\) Reactions

** Exchange Potentials in Relativistic Hartree-Fock Theory of Closed Shell Nuclei

** Relativistic PWIA for \((p,\pi^+)\) Reactions

** Relativistic Effects in \((p,\pi^+)\) Pionic Stripping

**Coupled Channel Theory of Pion Deuteron Reaction Applied to Threshold Scattering**

**Can Relativistic Pionic Stripping Explain (p,pi⁺) Reactions?**

**Pion Nucleon Vertex Function with One Nucleon Off Shell**

**Off-Mass-Shell Coupled Equations for the πNN-NN System**

**p + p → π⁺ + d Reaction at 0.8 GeV/c**

**The Differential Cross Section and Polarization in p + p → d + π⁺**

**The Reaction p + p → d + π⁺ with a Polarized Beam and Target**

**The Differential Cross Section and Polarization in p + p → d + π⁺**

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**Threshold Production of Positive Pions and the Form of the πNN Vertex**
** Pion Production with Eclarized Beams and Targets

** Consequences of Wave Function Orthogonality for Medium Energy Nuclear Reactions

** Critique of Brute-Force Orthogonalization for Continuum Wave Functions

** Pseudoscalar-Pseudovector Equivalence of Threshold Production and Absorption of Pions

** S-Wave Pion-Nucleus Dynamics in the Sigma-plus-Omega Model

** Pion Nucleon Vertex Function and the One-Pion Exchange Potential

** Pion-Nucleon Vertex Function with an Off-Shell Nucleon

** Pion Production and Absorption in Nuclear Reactions. I. The Vertex Function

** Pion Production in the Proton Deuteron Interaction

** The Reaction d(p,pi+)t

** Near Threshold Positive Pion Production by Protons on Nuclei

** Energy Dependence of Pion Production by Protons on Nuclei
** The Deuteron D-State and the $\pi^+ + \text{d} \rightarrow p + p$

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** A Study of the Reaction $\pi^+ + \text{d} \rightarrow p + p$ for Pion Energies Between 142 and 262 MeV

** Pionic Disintegration of the Deuteron

** Exact Solution of a Model for $\pi^- + \text{d}$ Induced Reactions and its Application to Pion-Nucleus Reactions

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** Angular Distributions for the Reactions $p + p \rightarrow d + \pi^+$ and $p + d \rightarrow t + \pi^+$ at 800 MeV

** The $(p,n\pi^+)$ Reaction and the $NN\pi$ Vertex

** The Pionic Disintegration of the Deuteron and the Absorptive Pion Nucleus Optical Potential

** Nucleon-Nucleon Dynamics at Medium Energies (II) Results for NN Phase Parameters

** Negative Pion Production from Bombardment of $^9Be$ with 200 MeV Polarized Protons

** Positive Pion Production by 149-166 MeV Protons on $^{16}C$ and $^{28}Si$

** $(p,\pi^+)$ Reaction on 1p Shell Nuclei at Proton Energy 200 MeV

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** Effect of Pion Distortion on the Asymmetry in (p,pi+) Reactions on Light Nuclei
DATA SUMMARY

The following table summarizes the various \((p,\pi)\) and \((\pi,p)\) experimental data available and shows the approximate energy and angular range covered by each experiment. Detailed balance and isospin have been used to test all reactions such as \((\pi,p)\) under the appropriate \((p,\pi^+)\) or \((p,\pi^-)\) heading.
<table>
<thead>
<tr>
<th>REACTION</th>
<th>E&lt;sub&gt;LAB&lt;/sub&gt; (MeV)</th>
<th>APPROXIMATE RANGE OF θ&lt;sub&gt;cm&lt;/sub&gt;</th>
<th>REFERENCES</th>
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<tbody>
<tr>
<td>(^9\text{Be}(p,\pi^+))^{10}\text{Be}</td>
<td>185</td>
<td>15 - 135</td>
<td>Da71, Da73a</td>
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<td>200</td>
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<td>Au78, Ma80a</td>
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<td>225,250</td>
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<td>Au80b</td>
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<td>Di80a, Br79</td>
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<td>800</td>
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<td>Ho79c, Ho79d, Ho80a</td>
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<td>(^{10}\text{B}(p,\pi^+))^{11}\text{B}</td>
<td>145 - 200</td>
<td>0 - 155</td>
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<td>154</td>
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<td>154</td>
<td>16 - 55</td>
<td>Le74, Le75</td>
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<td>15 - 135</td>
<td>Ho77, Ho79a</td>
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<td>200</td>
<td>25</td>
<td>So80a</td>
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<td>320 - 605</td>
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<td>(^{12}\text{C}(p,\pi^+))^{13}\text{C}</td>
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<td>183</td>
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<td>600</td>
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<td>(^{13}\text{C}(p,\pi^+))^{14}\text{C}</td>
<td>154</td>
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<td>25</td>
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<td>(^{14}\text{N}(p,\pi^+))^{15}\text{N}</td>
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<td>15 - 33</td>
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<td>(^{15}\text{O}(p,\pi^+))^{16}\text{O}</td>
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<td>205</td>
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<td>(^{16}\text{O}(p,\pi^+))^{17}\text{O}</td>
<td>154 - 174</td>
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<td>Pi78, Sj80b, Sc80</td>
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<td>REACTION</td>
<td>( E_p^{\text{LAB}} ) (MeV)</td>
<td>( Q_{\pi \text{cm}} ) Range</td>
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<td>( ^1\text{H}(p,\pi^+))^2\text{H}</td>
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<td>5 - 175</td>
<td>Wi71, Ri70, Jo78a, Wa79, Ma80a</td>
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<th>( Q_{\pi \text{cm}} ) Range</th>
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<td>400 - 580</td>
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<td>Cr60, Pe73, Do73</td>
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<td>REACTION</td>
<td>$E_{p}^{LAB}$ (MeV)</td>
<td>APPROXIMATE RANGE OF $Q_{cm}$</td>
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<td>$^{25}$Mg($p',\pi^+$)$^{26}$Mg</td>
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<td>15 - 48</td>
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<td>$^{26}$Mg($p',\pi^+$)$^{27}$Mg</td>
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<td>40 - 130</td>
<td>Ho78a</td>
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<td>$^{28}$Si($p',\pi^+$)$^{29}$Si</td>
<td>149 - 160</td>
<td>10 - 150</td>
<td>Be80a,Sj80b,Sc80</td>
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<td>$^{90}$Zr($p',\pi^+$)$^{91}$Zr</td>
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<td>25 - 155</td>
<td>Pi78,Be78,Sc80</td>
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<td>$^{208}$Pb($p',\pi^+$)$^{209}$Pb</td>
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<td>$^{9}$Be($p',\pi^-$)$^{10}$C</td>
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<td>$^{12}$C($p',\pi^-$)$^{13}$O</td>
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<td>Da73c, Da73d</td>
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<td>$^{26}$Mg($p',\pi^-$)$^{27}$Si</td>
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<td></td>
<td>180</td>
<td>40 - 130</td>
<td>Ho77, Ho78a</td>
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</table>
SUBJECT INDEX

Experiment:

pp → πd:
   Ae76, A171, Ap80, Ax76, Ba70, Ch80c, Do70a, Ho80, Hu80, Ja80b, Jo78a, K180c, Ma80a, Na79, Pr76, Pr78, Ri70, Se78, Sp75, Wa79, We80, Wi70

NN → NNπ:
   Ha80, Hu78, Th77

pd → tπ:
   Ab80, As77, Au80a, Ba73b, Bo63, Ca78, Ch64, Cr60, Do73, Fr54, Fr74a, Fr80a, Ga72, Gr80b, Ha60, Is78, Jo79, Ka78, Ka80b, Ma80a, Pe73, Se78

pd → ndπ:
   Ho78c, Lo79

A(p,π)A+1, A>2
   Uppsala: Da71, Da73a, Da73b, Da73c, Da73d, Da74a, Da74b, Ho78a, Ho78b, Ho79a, Ho79b
   Indiana: Be78, Be79, Be80a, Be80b, Ho77, Ho80b, Ja80a, Ma79a, Ma79b, Ma79c, P178, P179, Sc80, Sj80a, Sj80b, So80a, So80b
   TRIUMF: Au78, Au80b, Jo78a, Jo78b, Jo79, Lo80, Ma80a
   Saclay/Orsay: Ba80, Ba76a, Ba77a, Ba77b, Bo79, Br79, Co78, Di80a, Le74, Le75, Le76a, Le76b, Ta76
   LAMPF: Am74, Am78, An79, An80, Do80, Ho79c, Ho79d, Ho80a, Ka78, Ka79a, Ka80a, Ka80b, Ka80c
   Misc.: Do70b, Ga72, He58, In71, Ro72

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Theory:

pp → πd:
   A178, Br77b, Ch80a, Ch80b, Gi80b, Go74, Go75, Gr76a, Gr76b, Gr79b, Ha79, Ka79b, Ka79c, Ka79d, Ka80d, Ka80e, Ka80f, Ka80g, Ke79a, La70, Ma55, Ma80b, Ma80c, Ma80d, M177, N177, Ni178a, Ni178b, Ni179, Ni80, R176, R177, R180, Sc68, Sh80, Sp75, We78b, Ya64

NN → NNπ:
   Av79, Ba71, Be80d, Bo74b, Bo76, Br70, Du80, Gr78, K178, K180a, K180b, Mi77, Mi80, Si80, Th79, Um80, Ve79, We77

pd → tπ:
   Bh73, Bh76, Bh77b, B154, Fe74, Fe75a, Fe75b, Fe77, Fr80b, Gr79a, Gr79b, H177a, Ja78, Pa68, Ru52

A(p,π)A+1
   Born Approximation and DWBA Single Nucleon Models: Am72, Di76e, Ei73a, Ei73b, Ho74, Ho79a, Jo70, Ke73, Ke79b, Ki75, Ku77a, Ku77b, Ku79, Le66, Le76c, M174a, M174b, No76a, Re75, Re80, Ro73, Ts79a, Ts79b, Wh80
   Other Single Nucleon and Related Models: Bh73, Bh77a, Bh77b, Di73a, Di73b, Di74a, Gi77a, Gi80a, Gr79a, Gr79c, Lo74
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Misc.: A179, Bl77, Di76d, Di77b, La72, La79