

COMPILATION OF HIGH ENERGY PHYSICS REACTION DATA: INVENTORY OF THE PARTICLE DATA GROUP HOLDINGS 1980

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ABSTRACT

We present a compilation of reaction data taken from experimental high energy physics journal articles, reports, preprints, theses, and other sources. Listings of all the data are given, and the data points are indexed by reaction and momentum, as well as by their source document. Much of the original compilation was done by others working in the field. The data presented also exist in the form of a computer-readable and searchable database; primitive access facilities for this database are available.

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PART I
DESCRIPTIVE TEXT

A. INTRODUCTION

The Berkeley Particle Data Group (BPDG) began publishing compilations of reaction (scattering) data in 1969. In the ensuing years, several groups, including the BPDG, have published a considerable number of reaction-data compilations. These compilations, however, have generally not been able to keep up with the explosive growth in volume and variety of reaction data.

In 1971, in an attempt to consolidate and standardize the results of many compilations and make it more likely that such efforts would continue, the BPDG began studying how to organize all reaction data in a comprehensive manner. In the years since then, an expanded version of the Particle Data Group (including contingents from Cal-Tech and the United Kingdom) has designed and implemented, and is now utilizing on a limited basis, a unified system of encoding procedures and computer programs capable of handling most reaction data and related bibliographical information. Key elements of this system are a series of interrelated databases, powerful and flexible encoding languages,¹ a single generalized database management system for handling the data in all databases (the Berkeley Database Management System, BDBMS²), and a system of specialized programs interfacing to BDBMS which service users' needs such as graphics, fitting, generating special format reports, etc.

There are three main databases: The Document File contains bibliographic information and experiment descriptions for all experimental papers issued since 1969, and for some earlier papers (about 20,000 documents in all). The contents of this file, as of mid-1978, were published as LBL-90.³ The Proposal File contains descriptions of all current, approved experiment proposals. Its contents were last published in mid-1980 as LBL-91 Revised.⁴ The third file is the Reaction-Data File described in this report. While we plan to publish the contents of each database only periodically, we hope eventually to keep the databases themselves up-to-date on a steady-state basis.

This report contains Indices to and Listings of all reaction data so far entered into the Reaction-Data File. This compilation is, unfortunately, not complete or current in all areas, and has not been thoroughly checked. Nevertheless, it is by far the largest compilation of reaction data so far published; it contains in one place, in one uniform

presentation, data previously available only from different sources in differing formats. In a few areas, it contains new data, never before published. The main purpose of this report, however, is not the presentation of these data, but the announcement of this new reaction-data compilation effort. The motivation for publishing the reaction compilation in such an incomplete state is to solicit user response to this effort, both to help correct errors and omissions and also to suggest ways in which we can develop this system to be of maximum value to the user community. Even with substantially more manpower, we could not hope to encode the backlog of all old data, establish steady-state encoding of all new data, and provide services which one would hope to have. We expect user response to help guide us in establishing priorities in these areas. Our hope is to make the data in our databases directly and easily accessible to users (by either phone link or tape exchange), providing various support packages (e.g., graphics) to accomplish this goal; such direct access is already possible in a somewhat rudimentary fashion.

B. DATA COVERAGE

1. Existing Compilations

The bulk of the data in the Reaction-Data File was obtained from existing compilations, both of the BPDG and of outside sources. Some of these compilations have appeared in print and some have not. In the Data Listings (on microfiche), most data sets are labeled by the name of the compilation from which the data were obtained. The list of such compilations, and guides thereto, is as follows (the compilation short code, and, where different, the label used on the fiche for the compilation, is given in square brackets):

O. Benary et al., "A Compilation of YN Reactions," UCRL-20000 YN (Jan. 1970) [BENARY 70B, referred to on fiche with special code PDG3].

O. Benary et al., "NN and ND Interactions Above 0.5 GeV/c - A Compilation," UCRL-20000 NN (Aug. 1970) [BENARY 70, referred to on fiche with special code PDG3].

E. Bracci et al., "Compilation of Cross Sections. I - π and n Induced Reactions," CERN/HERA 72-1 (May 1972) [BRACCI 72].

E. Bracci et al., "Compilation of Cross Sections. II -

K^- and K^+ Induced Reactions," CERN/HERA 72-2 (Oct. 1972) [BRACCI 72B].

E. Bracci et al., "Compilation of Cross Sections. π^+ - p and p Induced Reactions," CERN/HERA 73-1 (June 1973) [BRACCI 73].

J. Bystricky et al., "Elastic Nucleon Nucleon Scattering Data 270-3000 MeV," CEA-M-1547-E (1972) [BYSTRICKY 72].

D. M. Chew et al., " n^+p , n^+n , and n^+d Interactions - A Compilation," LBL-53 (May 1973) [CHEW 73B].

R. L. Crawford, unpublished πN data compilation [referred to on fiche as CRAWFORD 77, although never published; superseded by Glasgow photoproduction compilation (see "New Compilations" section immediately below)].

J. E. Enstrom et al., " $\pi\pi$ and πN Interactions - A Compilation," LBL-58 (May 1972) [ENSTROM 72, referred to on fiche with special code PDG3].

G. C. Fox et al., "Compilation of Elastic Data," UCRL-20001 (Jan. 1970), and unpublished data compilation [referred to on fiche with special codes FOX1, FOX2, FOX5-FOX8, AND LST1-LST7].

G. Giacomelli, "A Compilation of Pion-Nucleon Scattering Data," CERN/HERA 69-1 (1969) [GIACOMELLI 69, referred to on fiche with special codes FOX3 and FOX4].

M. L. Gupta et al., "A Computerized Compilation of K^+N Scattering Data for Two Body Final States up to 3.0 GeV/c," VPRNA-2-70 (1970) [GUPTA 70].

J. Kasman, unpublished inclusive data compilation.

R. L. Kelly, unpublished πN data compilation.

C. Lovelace et al., " πN Two-Body Scattering Data: I. A User's Guide to the Lovelace-Almeida Data Tape," LBL-63 (Apr. 1973), and unpublished data compilation [LOVELACE 73, incorrectly referred to on fiche as LOVELACE 71].

M. H. MacGregor et al., "(p,p) and (n,p) Data Listings 0 to 750 MeV," UCRL-50426 (1968) [MACGREGOR 68].

L. R. Price et al., "A Compilation of K^+N Reactions," UCRL-20000 K^+N (Sept. 1969) [PRICE 69, referred to on fiche with special code PDG3].

J. L. Schonfelder, "A Data-handling System for πN Scattering Data," Univ. of Birmingham, England preprint (1972) [referred to on fiche as SCHONFELDER 70?].

F. Uchiyama et al., " K^0_N Interactions - A Compilation," LBL-55 (Mar. 1972) [UCHIYAMA 72].

F. Wagner, unpublished data compilation [referred to on fiche as WAGNER 71B, although never published].

Each of these compilations has different standards and different coverage as to data types and period of time. No effort has yet been made to remove duplication due to the same data appearing in different compilations. Most data have not been checked by us against the original source documents and so should be used with care.

2. New Compilations

Data from five ongoing, steady-state compilations being carried out by the U. K. contingent of the PDG are also included. These are: 1) the Durham 2-body compilation; 2) the Glasgow photoproduction compilation; 3) the Rutherford hadron-induced inclusive compilation; 4) the Rutherford lepton-induced inclusive compilation; and 5) the Durham e^+e^- compilation. While the encoding of data by this group is an ongoing process, so that the Reaction-Data File is always current in these areas, the listings included here cover only the period up to late 1979.

3. Limitations

Again we repeat that data from the present compilation should be used with great care. The data presented here were not checked systematically against the source documents by us.

In no area is coverage complete and in only a few cases is it up-to-date. For certain classes of data, there is considerable duplication and thus the possibility of inconsistencies exists.

The handling of systematic errors is especially uneven. The five steady-state compilations mentioned above quote them uniformly and unambiguously. Most older compilations do not quote them at all, and some quote them ambiguously. Thus, except in the case of the steady-state compilations, the systematic errors should be checked out against the source document. Another problem is the handling of binned data; for instance, a $d\sigma/dt$ measurement in a t bin between 0 and -0.05 $(\text{GeV}/c)^2$ will in some compilations be recorded as a measurement at $t = -0.025$ $(\text{GeV}/c)^2$ without indication of the averaging. Although most data have been recorded in the form in which they were presented in the original papers, some have been converted into a different form, e.g., from $d\sigma/d\Omega$ to $d\sigma/dt$, before being compiled.

Although the accelerator and detector used by an experiment are sometimes given in comments in this compilation, this information is

spotty; for a more complete specification of such details, see LBL-90.³

C. REQUESTS FOR DATA

Within reason, we will try to answer personal requests for data. Although initially we would expect to send printed listings in response to such requests, as time goes on we want to encourage more and more users to access our databases directly. For physicists in Britain, or at CERN or DESY, this has been possible since 1978, using the U. K. SRC network.⁵ It is hoped that a telephone link will be available soon in the U. S. See the list of contacts below if you are interested in this kind of access.

We also have on hand hard copies of almost all papers for which we have encoded the data. In those cases where the source document is a preprint and is no longer generally available, we may be able to provide a copy upon request. Our limited budget does not allow us to distribute copies of published papers.

We welcome corrections to any of the data in the Listings. We would further like to encourage experimenters to send us data that are too voluminous to publish in journals or preprints.

For any of these matters concerning the Reaction-Data File, please contact one of the following:

Dr. Geoffrey C. Fox
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Dr. Brian J. Read
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Durham City DH1 1LE, England
Phone: (385) 64971

Dr. Alan Rittenberg or Dr. Charles P. Horne
Particle Data Group 50-308
Lawrence Berkeley Laboratory
Berkeley, CA 94720, USA
Phone: (415) 486-5885 or FTS on-net 451-5885

D. USERS' GUIDE

The substantive information in this report is organized as follows:
The Data Listings themselves are given only on microfiche, which accompany

this printed report as Part IV. All data from a given document are grouped together on the fiche, and the documents are ordered by their first author and year. Each Data Listing entry has some basic bibliographic information, comments, systematic error information (if encoded), and the actual data. For the most part, the format, notation, and particle, variable, and observable names are self-explanatory. However, for completeness, Vocabularies have been provided in PART III which explain the various names and abbreviations used; also, for those desiring more detailed knowledge of encoding conventions, the entire Reaction-Data File Encoding Manual has been put onto a fiche and is included with this report. Two Indices are provided to cross-reference the Data Listings; these Indices are described and presented in PART II.

E. LOCATING DATA IN THE DATA LISTINGS

The Data Listings, on fiche, are ordered alphabetically by the "short code" of the document from which the data were extracted. The short code is a unique identifier assigned by us to each document. It is composed of the first author's last name, the year of issue, and a uniqueness letter or letters, if required (e.g., JONES 67). If there is more than one document with the same first author and the same issue date, the second short code would be given the letter B (e.g., JONES 67B). Since a short code must have no more than 16 characters, some long names are truncated. The short code is based on the first version of the document received (often the preprint), so the date of issue may be earlier than the date of journal publication, and in rare cases, the short code may not be based on the first author of the journal publication. All the short codes in this document should be identical to those in LBL-90.³ However, we do have data from papers not yet entered into our LBL-90 database. These documents have a ? as the last character of their short codes. The bibliographical information in each record should be sufficient to locate the source document, whether or not it appeared in LBL-90.

In steady-state, all data from a given document would be encoded in one record in the database and would appear in one unit on the fiche. Here, however, because we have used data from many sources, and for other historical reasons, data from the same paper may be broken up into several units; however, these units will be contiguous on the fiche.

Two Indices have been provided to help locate data of interest:

The Short-Code/Reference Index: This Index lists the short codes and references of all documents represented in the compilation. Thus, if the first author of a document were known, either a priori or by use of the Reaction/Momentum Index described below, then this Index would be used to determine the journal or preprint reference, so that the actual paper could be located. The reference information may also be used to distinguish between different papers by the same author in the same year.

The Reaction/Momentum Index: This Index lists all reactions (and their momenta) for which data have been encoded. Thus, if data on a given reaction were desired, this Index would be used. For each reaction, every momentum at which data have been encoded is listed, and, for each reaction/momentum pair, the short codes for papers containing the relevant data are given. Beam momenta are always given as equivalent lab momentum (in GeV/c) for a stationary target, except for e^+e^- collisions, where the total center-of-mass energy in GeV is given instead. The Index is ordered as follows: in each reaction, the beam and target are given first, followed by the final state particles in a 'natural' order. Reactions are then ordered lexicographically, i.e., alphabetically by the first particle, or, if that is identical, by the second particle, etc.

The Data Listings and both Indices are preceded by 'Illustrative Keys,' giving details about the format of the presentations.

F. ACKNOWLEDGEMENTS

We would like to thank J. Gee for assisting with much of the data input and output at Cal-Tech; T. A. Lasinski and F. Uchiyama for participating in the early design stages of the Reaction-Data File language; and A. H. Rosenfeld for providing a great deal of inspiration at the beginning of this project.

REFERENCES

1. Particle Data Group, "Particle Physics Data System Reaction-Data File Encoding Manual," PDG-3200; Particle Data Group, "Particle Physics Data System Document File Encoding Manual," Particle Data Group, PDG-3100.
2. D. R. Richards, "BIMS User's Manual," LBL-4683 (Revision 1); D. R. Richards, "BIMS Programmer's Manual," LBL-4684.
3. C. P. Horne et al., "An Indexed Compilation of Experimental High Energy Physics Literature," LBL-90 (Sept. 1978).
4. C. G. Wohl et al., "Compilation of Current High Energy Physics Experiments," LBL-91 Revised (April 1980).
5. F. D. Gault et al., "Guide to the Durham-Rutherford High Energy Physics Databases," Second Edition, RL-79-094 (Dec. 1979).

PART II
INDICES

SHORT-CODE/REFERENCE INDEX

This Index lists the short codes and references of all documents represented in this compilation. Thus, if the first author of a document were known, either a priori or by use of the Reaction/Momentum Index which follows, then this Index would be used to determine the journal or preprint reference, so that the actual paper could be located. The reference information may also be used to distinguish between different papers by the same author in the same year. The primary reference is given first, followed by all secondary (e.g., preprint) references. For more detailed bibliographic information than is given here, please refer to LBL-90, or, for post-1977 articles, contact the Berkeley Particle Data Group.

ILLUSTRATIVE KEY

DOCUMENT SHORT CODE - THE DATA FROM THIS DOCUMENT CAN BE FOUND IN THE DATA LISTINGS ON MICROFICHE

PRIMARY REFERENCE - SEE THE REFERENCE VOCABULARY FOR JOURNAL ABBREVIATIONS

SECONDARY REFERENCES - SEE THE REFERENCE VOCABULARY FOR JOURNAL ABBREVIATIONS

BRADEN 71	PL 588, 457	23, 6
BRATENBERG 58	PL 115, 957	23, 6
BRAD 71	PL 27, 1485	23, 6
BRAD 75	RP 858, 232	23, 6
BRADEN 76	PL 658, 181	23, 6
BRADEN 76B	PL 658, 184	23, 6
BRADEN 77	PL 698, 253	23, 7
BRADEN 78B	PL 82, 488	23, 7
BRADEN 78C	PL 82, 1212	23, 7
BRADEN 79C	PL 44, 703	23, 7
BRADEN 79C	RP 854, 61	23, 7
BRADEN 79	RP 855, 486	23, 7
BRADENSCHEIC 64	PL 12, 305	23, 7
BRADENSCHEIC 68	PL 26, 405	23, 7
BRADENSCHEIC 71	2P 245, 272	23, 7 *
BRADENSCHEIC 70B	2P 245, 253	23, 7
BRADENSCHEIC 73	RP 851, 157	23, 8
BRADENSCHEIC 73B	RP 851, 167	23, 8

MICROFICHE LOCATION - FICHE NUMBER AND COLUMN WHERE THE DATA LISTINGS FOR THIS DOCUMENT BEGIN, AN ASTERISK MEANS THAT THIS DOCUMENT IS COMBINED WITH, AND ALPHABETIZED ACCORDING TO, ANOTHER DOCUMENT ON THE FICHE (USUALLY BECAUSE THE TWO DOCUMENTS SHARE SOME DATA)

SHORT-CODE/REFERENCE INDEX

[illegible]

SHORT-CODE/REFERENCE INDEX (CONT'D)

[illegible]

SHORT-CODE/REFERENCE INDEX (CONT'D)

[illegible]

SHORT-CODE/REFERENCE INDEX (CONT'D)

[illegible]

SHORT-CODE/REFERENCE INDEX (CONT'D)

[illegible]

SHORT-CODE/REFERENCE INDEX (CONT'D)

[illegible]

SHORT-CODE/REFERENCE INDEX (CONT'D)

[illegible]

SHORT-CODE/REFERENCE INDEX (CONT'D)

[illegible]

SHORT-CODE/REFERENCE INDEX (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX

This Index lists all reactions for which data have been encoded. Thus, if data on a given reaction were desired, this Index would be used. For each reaction, every momentum at which data have been encoded is listed, and, for each reaction/momentum pair, the short codes for papers containing the relevant data are given. Beam momenta are always given as equivalent lab momentum (in GeV/c) for a stationary target, except for e^+e^- collisions, where the total center-of-mass energy in GeV is given instead.

The Index is ordered as follows: in each reaction, the beam and target are given first, followed by the final state particles in a 'natural' order. Reactions are then ordered lexicographically, i.e., alphabetically by the first particle (the beam), or, if that is identical, by the second particle (the target), etc., through all the final state particles. A list of all reactions appearing in the Index is given immediately following this discussion. The reaction numbers appearing in this list can be used to help locate the proper page in the full Index for the desired reaction, via the reaction number range given at the top of each page.

The particle names used in the reactions are given in the Particle Vocabulary in Part III of this report; these are generally the same names as used in the 'Review of Particle Properties.' However, some names, particularly those appearing in topological reactions, are somewhat ambiguous; e.g., the terms 'missing mass' and 'neutrals' are often used interchangeably. Another ambiguity arises in the case of reactions involving a deuteron target; some authors write the reaction as such (with two nucleons, one often a spectator, in the final state), while others write the reaction with a neutron target (and only one nucleon in the final state). Also, a reaction with a nuclear target might be encoded with the specific nucleus, such as BE, or with the generic name NUCLEUS if the exact nucleus is uncertain. For all of these reasons, and more, care should be exercised by the user when looking for a given reaction.

The syntax used for writing reactions is generally straightforward. As an example, the reaction $\pi^- p \rightarrow \pi^- \Delta^+$ would be written as

PI- P --> PI- DEL+ .

In this reaction, since no specific decay mode for the Δ^+ is indicated, it is understood that the measured quantity, e.g. the cross section, is for all decay modes, that is, for all Δ^+ . If the quantity measured applied only to a particular decay mode, $p\pi^0$, say, then the reaction would be written as



That is, angular brackets are used to indicate specific decay modes of the preceding particle. Also, sometimes a compound final state may have been detected; in this case, the two (or more) final states are written separated with a '+' (or '-' in the case of subtraction) surrounded by blanks; e.g.,



ILLUSTRATIVE KEY

INITIAL STATE OF THE REACTION SEE THE PARTICLE VOCABULARY FOR NOMENCLATURE	***** GADMA DELT+ --> ***** +ANTINEUTRINO -285-4.22 ARMSTRONG 72 2.00-4.00 ARMSTRONG 72 2.00-9.51 MICHALOWSKI 771 3.70-17.8 CALDWELL 73 4.07-18.4 CALDWELL 73 6.30 EISENBURG 740 7.30 ALEXANDER 746 9 BOTANICK 716	DOCUMENT SHORT CODE. THE REFERENCE FOR THIS DOCUMENT CAN BE FOUND IN THE SHORT- CODE/REFERENCE INDEX. THE DATA CAN BE FOUND IN THE DATA LISTING ON MICROFILM
FINAL STATE OF THE REACTION SEE THE PARTICLE VOCABULARY FOR NOMENCLATURE	-AP ANTINEUTRINO 9 BOTANICK 716	
LAB MOMENTUM IN GEV-C (EXCEPT FOR π^+ AND π^-) TOTAL CENTER OF MASS ENERGY IN GEV	-DEUT PI+ PI- 3.00 RAPO 77 4.35 EISENBURG 740 7.30 ALEXANDER 746 ALEXANDER 750 -DEUT 2PI+ 2PI- 7.30 ALEXANDER 746	

REACTION/MOMENTUM INDEX - LIST OF REACTIONS (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX - LIST OF REACTIONS (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX - LIST OF REACTIONS (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX - LIST OF REACTIONS (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX - LIST OF REACTIONS (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX - LIST OF REACTIONS (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX - LIST OF REACTIONS (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX - LIST OF REACTIONS (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX

REACTANTS: 1, 100-1000

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTIONS 142 TO 149

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTANTS 952 70-400

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524
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REACTION/MOMENTUM INDEX (CONT'D)

REACTANTS: 500, 100, 500

DATE	TIME	FROM	TO	FLIGHT	STATUS	REMARKS
2023-10-27	08:00	NEW YORK	LOS ANGELES	AA1	OK	
2023-10-27	08:30	LOS ANGELES	NEW YORK	AA2	OK	
2023-10-27	09:00	NEW YORK	LOS ANGELES	AA3	OK	
2023-10-27	09:30	LOS ANGELES	NEW YORK	AA4	OK	
2023-10-27	10:00	NEW YORK	LOS ANGELES	AA5	OK	
2023-10-27	10:30	LOS ANGELES	NEW YORK	AA6	OK	
2023-10-27	11:00	NEW YORK	LOS ANGELES	AA7	OK	
2023-10-27	11:30	LOS ANGELES	NEW YORK	AA8	OK	
2023-10-27	12:00	NEW YORK	LOS ANGELES	AA9	OK	
2023-10-27	12:30	LOS ANGELES	NEW YORK	AA10	OK	
2023-10-27	13:00	NEW YORK	LOS ANGELES	AA11	OK	
2023-10-27	13:30	LOS ANGELES	NEW YORK	AA12	OK	
2023-10-27	14:00	NEW YORK	LOS ANGELES	AA13	OK	
2023-10-27	14:30	LOS ANGELES	NEW YORK	AA14	OK	
2023-10-27	15:00	NEW YORK	LOS ANGELES	AA15	OK	
2023-10-27	15:30	LOS ANGELES	NEW YORK	AA16	OK	
2023-10-27	16:00	NEW YORK	LOS ANGELES	AA17	OK	
2023-10-27	16:30	LOS ANGELES	NEW YORK	AA18	OK	
2023-10-27	17:00	NEW YORK	LOS ANGELES	AA19	OK	
2023-10-27	17:30	LOS ANGELES	NEW YORK	AA20	OK	
2023-10-27	18:00	NEW YORK	LOS ANGELES	AA21	OK	
2023-10-27	18:30	LOS ANGELES	NEW YORK	AA22	OK	
2023-10-27	19:00	NEW YORK	LOS ANGELES	AA23	OK	
2023-10-27	19:30	LOS ANGELES	NEW YORK	AA24	OK	
2023-10-27	20:00	NEW YORK	LOS ANGELES	AA25	OK	
2023-10-27	20:30	LOS ANGELES	NEW YORK	AA26	OK	
2023-10-27	21:00	NEW YORK	LOS ANGELES	AA27	OK	
2023-10-27	21:30	LOS ANGELES	NEW YORK	AA28	OK	
2023-10-27	22:00	NEW YORK	LOS ANGELES	AA29	OK	
2023-10-27	22:30	LOS ANGELES	NEW YORK	AA30	OK	
2023-10-27	23:00	NEW YORK	LOS ANGELES	AA31	OK	
2023-10-27	23:30	LOS ANGELES	NEW YORK	AA32	OK	
2023-10-28	00:00	NEW YORK	LOS ANGELES	AA33	OK	
2023-10-28	00:30	LOS ANGELES	NEW YORK	AA34	OK	
2023-10-28	01:00	NEW YORK	LOS ANGELES	AA35	OK	
2023-10-28	01:30	LOS ANGELES	NEW YORK	AA36	OK	
2023-10-28	02:00	NEW YORK	LOS ANGELES	AA37	OK	
2023-10-28	02:30	LOS ANGELES	NEW YORK	AA38	OK	
2023-10-28	03:00	NEW YORK	LOS ANGELES	AA39	OK	
2023-10-28	03:30	LOS ANGELES	NEW YORK	AA40	OK	
2023-10-28	04:00	NEW YORK	LOS ANGELES	AA41	OK	
2023-10-28	04:30	LOS ANGELES	NEW YORK	AA42	OK	
2023-10-28	05:00	NEW YORK	LOS ANGELES	AA43	OK	
2023-10-28	05:30	LOS ANGELES	NEW YORK	AA44	OK	
2023-10-28	06:00	NEW YORK	LOS ANGELES	AA45	OK	
2023-10-28	06:30	LOS ANGELES	NEW YORK	AA46	OK	
2023-10-28	07:00	NEW YORK	LOS ANGELES	AA47	OK	
2023-10-28	07:30	LOS ANGELES	NEW YORK	AA48	OK	
2023-10-28	08:00	NEW YORK	LOS ANGELES	AA49	OK	
2023-10-28	08:30	LOS ANGELES	NEW YORK	AA50	OK	

REACTION/MOMENT INDEX (CONT'D)

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REACTION NO.	REACTION NO.	REACTION NO.	REACTION NO.
405	406	407	408
409	410	411	412
413	414	415	416
417	418	419	420
421	422	423	424
426	427	428	429
431	432	433	434
436	437	438	439
441	442	443	444
446	447	448	449
451	452	453	454
456	457	458	459
461	462	463	464
466	467	468	469
471	472	473	474
476	477	478	479
481	482	483	484
486	487	488	489
491	492	493	494
496	497	498	499
501	502	503	504
506	507	508	509
511	512	513	514
516	517	518	519
521	522	523	524
526	527	528	529
531	532	533	534
536	537	538	539
541	542	543	544
546	547	548	549
551	552	553	554
556	557	558	559
561	562	563	564
566	567	568	569
571	572	573	574
576	577	578	579
581	582	583	584
586	587	588	589
591	592	593	594
596	597	598	599
601	602	603	604
606	607	608	609
611	612	613	614
616	617	618	619
621	622	623	624
626	627	628	629
631	632	633	634
636	637	638	639
641	642	643	644
646	647	648	649
651	652	653	654
656	657	658	659
661	662	663	664
666	667	668	669
671	672	673	674
676	677	678	679
681	682	683	684
686	687	688	689
691	692	693	694
696	697	698	699
700	701	702	703
704	705	706	707

REACTION/MOMENTUM INDEX (CONT'D)

RECEIVED: July 10, 1992

DATE	TIME	FROM	TO	FLIGHT	STATUS	REMARKS	DATE	TIME	FROM	TO	FLIGHT	STATUS	REMARKS
2023-10-27	08:00	DELHI	MUMBAI	AI-615	ON TIME		2023-10-27	08:00	MUMBAI	DELHI	AI-616	ON TIME	
2023-10-27	08:30	MUMBAI	CHENNAI	AI-617	ON TIME		2023-10-27	08:30	CHENNAI	MUMBAI	AI-618	ON TIME	
2023-10-27	09:00	CHENNAI	BANGALORE	AI-619	ON TIME		2023-10-27	09:00	BANGALORE	CHENNAI	AI-620	ON TIME	
2023-10-27	09:30	BANGALORE	HYDRABAD	AI-621	ON TIME		2023-10-27	09:30	HYDRABAD	BANGALORE	AI-622	ON TIME	
2023-10-27	10:00	HYDRABAD	COIMBATORE	AI-623	ON TIME		2023-10-27	10:00	COIMBATORE	HYDRABAD	AI-624	ON TIME	
2023-10-27	10:30	COIMBATORE	TRIVANDRUM	AI-625	ON TIME		2023-10-27	10:30	TRIVANDRUM	COIMBATORE	AI-626	ON TIME	
2023-10-27	11:00	TRIVANDRUM	THIRUVANANTHAPURAM	AI-627	ON TIME		2023-10-27	11:00	THIRUVANANTHAPURAM	TRIVANDRUM	AI-628	ON TIME	
2023-10-27	11:30	THIRUVANANTHAPURAM	CHENNAI	AI-629	ON TIME		2023-10-27	11:30	CHENNAI	THIRUVANANTHAPURAM	AI-630	ON TIME	
2023-10-27	12:00	CHENNAI	BANGALORE	AI-631	ON TIME		2023-10-27	12:00	BANGALORE	CHENNAI	AI-632	ON TIME	
2023-10-27	12:30	BANGALORE	HYDRABAD	AI-633	ON TIME		2023-10-27	12:30	HYDRABAD	BANGALORE	AI-634	ON TIME	
2023-10-27	13:00	HYDRABAD	COIMBATORE	AI-635	ON TIME		2023-10-27	13:00	COIMBATORE	HYDRABAD	AI-636	ON TIME	
2023-10-27	13:30	COIMBATORE	TRIVANDRUM	AI-637	ON TIME		2023-10-27	13:30	TRIVANDRUM	COIMBATORE	AI-638	ON TIME	
2023-10-27	14:00	TRIVANDRUM	THIRUVANANTHAPURAM	AI-639	ON TIME		2023-10-27	14:00	THIRUVANANTHAPURAM	TRIVANDRUM	AI-640	ON TIME	
2023-10-27	14:30	THIRUVANANTHAPURAM	CHENNAI	AI-641	ON TIME		2023-10-27	14:30	CHENNAI	THIRUVANANTHAPURAM	AI-642	ON TIME	
2023-10-27	15:00	CHENNAI	BANGALORE	AI-643	ON TIME		2023-10-27	15:00	BANGALORE	CHENNAI	AI-644	ON TIME	
2023-10-27	15:30	BANGALORE	HYDRABAD	AI-645	ON TIME		2023-10-27	15:30	HYDRABAD	BANGALORE	AI-646	ON TIME	
2023-10-27	16:00	HYDRABAD	COIMBATORE	AI-647	ON TIME		2023-10-27	16:00	COIMBATORE	HYDRABAD	AI-648	ON TIME	
2023-10-27	16:30	COIMBATORE	TRIVANDRUM	AI-649	ON TIME		2023-10-27	16:30	TRIVANDRUM	COIMBATORE	AI-650	ON TIME	
2023-10-27	17:00	TRIVANDRUM	THIRUVANANTHAPURAM	AI-651	ON TIME		2023-10-27	17:00	THIRUVANANTHAPURAM	TRIVANDRUM	AI-652	ON TIME	
2023-10-27	17:30	THIRUVANANTHAPURAM	CHENNAI	AI-653	ON TIME		2023-10-27	17:30	CHENNAI	THIRUVANANTHAPURAM	AI-654	ON TIME	
2023-10-27	18:00	CHENNAI	BANGALORE	AI-655	ON TIME		2023-10-27	18:00	BANGALORE	CHENNAI	AI-656	ON TIME	
2023-10-27	18:30	BANGALORE	HYDRABAD	AI-657	ON TIME		2023-10-27	18:30	HYDRABAD	BANGALORE	AI-658	ON TIME	
2023-10-27	19:00	HYDRABAD	COIMBATORE	AI-659	ON TIME		2023-10-27	19:00	COIMBATORE	HYDRABAD	AI-660	ON TIME	
2023-10-27	19:30	COIMBATORE	TRIVANDRUM	AI-661	ON TIME		2023-10-27	19:30	TRIVANDRUM	COIMBATORE	AI-662	ON TIME	
2023-10-27	20:00	TRIVANDRUM	THIRUVANANTHAPURAM	AI-663	ON TIME		2023-10-27	20:00	THIRUVANANTHAPURAM	TRIVANDRUM	AI-664	ON TIME	
2023-10-27	20:30	THIRUVANANTHAPURAM	CHENNAI	AI-665	ON TIME		2023-10-27	20:30	CHENNAI	THIRUVANANTHAPURAM	AI-666	ON TIME	
2023-10-27	21:00	CHENNAI	BANGALORE	AI-667	ON TIME		2023-10-27	21:00	BANGALORE	CHENNAI	AI-668	ON TIME	
2023-10-27	21:30	BANGALORE	HYDRABAD	AI-669	ON TIME		2023-10-27	21:30	HYDRABAD	BANGALORE	AI-670	ON TIME	
2023-10-27	22:00	HYDRABAD	COIMBATORE	AI-671	ON TIME		2023-10-27	22:00	COIMBATORE	HYDRAB			

REACTIONS FOR THE 2002

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTORS ARE TO BE

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

RENTALS: \$10 TO \$50

[illegible]

RENTING FROM TO OWN

REACTION/MOMENTUM INDEX (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTOR, 1945, 1950, 1955

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

WATSON, 2008 TO 2009

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTING 1.00 TO 1.00

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTIVE 1795 TO 1802

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTIVE, 1979 TO 1980

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

NEWTONS: 2000-2001

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTIONS 2000 TO 2005

REACTION	REACTION	REACTION	REACTION
2000	2001	2002	2003
2004	2005	2006	2007
2008	2009	2010	2011
2012	2013	2014	2015
2016	2017	2018	2019
2020	2021	2022	2023
2024	2025	2026	2027
2028	2029	2030	2031
2032	2033	2034	2035
2036	2037	2038	2039
2040	2041	2042	2043
2044	2045	2046	2047
2048	2049	2050	2051
2052	2053	2054	2055
2056	2057	2058	2059
2060	2061	2062	2063
2064	2065	2066	2067
2068	2069	2070	2071
2072	2073	2074	2075
2076	2077	2078	2079
2080	2081	2082	2083
2084	2085	2086	2087
2088	2089	2090	2091
2092	2093	2094	2095
2096	2097	2098	2099
2100	2101	2102	2103
2104	2105	2106	2107
2108	2109	2110	2111
2112	2113	2114	2115
2116	2117	2118	2119
2120	2121	2122	2123
2124	2125	2126	2127
2128	2129	2130	2131
2132	2133	2134	2135
2136	2137	2138	2139
2140	2141	2142	2143
2144	2145	2146	2147
2148	2149	2150	2151
2152	2153	2154	2155
2156	2157	2158	2159
2160	2161	2162	2163
2164	2165	2166	2167
2168	2169	2170	2171
2172	2173	2174	2175
2176	2177	2178	2179
2180	2181	2182	2183
2184	2185	2186	2187
2188	2189	2190	2191
2192	2193	2194	2195
2196	2197	2198	2199
2200	2201	2202	2203
2204	2205	2206	2207
2208	2209	2210	2211
2212	2213	2214	2215
2216	2217	2218	2219
2220	2221	2222	2223
2224	2225	2226	2227
2228	2229	2230	2231
2232	2233	2234	2235
2236	2237	2238	2239
2240	2241	2242	2243
2244	2245	2246	2247
2248	2249	2250	2251
2252	2253	2254	2255
2256	2257	2258	2259
2260	2261	2262	2263
2264	2265	2266	2267
2268	2269	2270	2271
2272	2273	2274	2275
2276	2277	2278	2279
2280	2281	2282	2283
2284	2285	2286	2287
2288	2289	2290	2291
2292	2293	2294	2295
2296	2297	2298	2299
2300	2301	2302	2303
2304	2305	2306	2307
2308	2309	2310	2311
2312	2313	2314	2315
2316	2317	2318	2319
2320	2321	2322	2323
2324	2325	2326	2327
2328	2329	2330	2331
2332	2333	2334	2335
2336	2337	2338	2339
2340	2341	2342	2343
2344	2345	2346	2347
2348	2349	2350	2351
2352	2353	2354	2355
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2364	2365	2366	2367
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2384	2385	2386	2387
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2396	2397	2398	2399
2400	2401	2402	2403
2404	2405	2406	2407
2408	2409	2410	2411
2412	2413	2414	2415
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2424	2425	2426	2427
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2492	2493	2494	2495
2496	2497	2498	2499
2500	2501	2502	2503
2504	2505	2506	2507
2508	2509	2510	2511
2512	2513	2514	2515
2516	2517	2518	2519
2520	2521	2522	2523
2524	2525	2526	2527
2528	2529	2530	2531
2532	2533	2534	2535
2536	2537	2538	2539
2540	2541	2542	2543
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2568	2569	2570	2571
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2576	2577	2578	2579
2580	2581	2582	2583
2584	2585	2586	2587
2588	2589	2590	2591
2592	2593	2594	2595
2596	2597	2598	2599
2600	2601	2602	2603
2604	2605	2606	2607
2608	2609	2610	2611
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2984	2985	2986	2987
2988	2989	2990	2991
2992	2993	2994	2995
2996	2997	2998	2999
3000	3001	3002	3003
3004	3005	3006	3007
3008	3009	3010	3011
3012	3013	3014	3015
3016	3017	3018	3019
3020	3021	3022	3023
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3076	3077	3078	3079
3080	3081	3082	3083
3084	3085	3086	3087
3088	3089	3090	3091
3092	3093	3094	3095
3096	3097	3098	3099
3100	3101	3102	3103
3104	3105	3106	3107
3108	3109	3110	3111
3112	3113	3114	3115
3116	3117	3118	3119
3120	3121	3122	3123
3124	3125	3126	3127
3128	3129	3130	3131
3132	3133	3134	3135
3136	3137	3138	3139
3140	3141	3142	3143
3144	3145	3146	3147
3148	3149	3150	3151
3152	3153	3154	3155
3156	3157	3158	3159

REACTION/MOMENTUM INDEX (CONT'D)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80																				

REACTION/MOMENTUM INDEX (CONT'D)

REACTIONS 2052 TO 2200

REACTION INDEX	REACTION INDEX	REACTION INDEX	REACTION INDEX
2052	2053	2054	2055
2056	2057	2058	2059
2060	2061	2062	2063
2064	2065	2066	2067
2068	2069	2070	2071
2072	2073	2074	2075
2076	2077	2078	2079
2080	2081	2082	2083
2084	2085	2086	2087
2088	2089	2090	2091
2092	2093	2094	2095
2096	2097	2098	2099
2100	2101	2102	2103
2104	2105	2106	2107
2108	2109	2110	2111
2112	2113	2114	2115
2116	2117	2118	2119
2120	2121	2122	2123
2124	2125	2126	2127
2128	2129	2130	2131
2132	2133	2134	2135
2136	2137	2138	2139
2140	2141	2142	2143
2144	2145	2146	2147
2148	2149	2150	2151
2152	2153	2154	2155
2156	2157	2158	2159
2160	2161	2162	2163
2164	2165	2166	2167
2168	2169	2170	2171
2172	2173	2174	2175
2176	2177	2178	2179
2180	2181	2182	2183
2184	2185	2186	2187
2188	2189	2190	2191
2192	2193	2194	2195
2196	2197	2198	2199
2200	2201	2202	2203

REACTING ZONE TO ZONE

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTIONS 2000 TO 2000

REACTION INDEX	REACTION INDEX	REACTION INDEX	REACTION INDEX
1.00-1.01	1.00-1.01	1.00-1.01	1.00-1.01
1.02	1.02	1.02	1.02
1.03	1.03	1.03	1.03
1.04	1.04	1.04	1.04
1.05	1.05	1.05	1.05
1.06	1.06	1.06	1.06
1.07	1.07	1.07	1.07
1.08	1.08	1.08	1.08
1.09	1.09	1.09	1.09
1.10	1.10	1.10	1.10
1.11	1.11	1.11	1.11
1.12	1.12	1.12	1.12
1.13	1.13	1.13	1.13
1.14	1.14	1.14	1.14
1.15	1.15	1.15	1.15
1.16	1.16	1.16	1.16
1.17	1.17	1.17	1.17
1.18	1.18	1.18	1.18
1.19	1.19	1.19	1.19
1.20	1.20	1.20	1.20
1.21	1.21	1.21	1.21
1.22	1.22	1.22	1.22
1.23	1.23	1.23	1.23
1.24	1.24	1.24	1.24
1.25	1.25	1.25	1.25
1.26	1.26	1.26	1.26
1.27	1.27	1.27	1.27
1.28	1.28	1.28	1.28
1.29	1.29	1.29	1.29
1.30	1.30	1.30	1.30
1.31	1.31	1.31	1.31
1.32	1.32	1.32	1.32
1.33	1.33	1.33	1.33
1.34	1.34	1.34	1.34
1.35	1.35	1.35	1.35
1.36	1.36	1.36	1.36
1.37	1.37	1.37	1.37
1.38	1.38	1.38	1.38
1.39	1.39	1.39	1.39
1.40	1.40	1.40	1.40
1.41	1.41	1.41	1.41
1.42	1.42	1.42	1.42
1.43	1.43	1.43	1.43
1.44	1.44	1.44	1.44
1.45	1.45	1.45	1.45
1.46	1.46	1.46	1.46
1.47	1.47	1.47	1.47
1.48	1.48	1.48	1.48
1.49	1.49	1.49	1.49
1.50	1.50	1.50	1.50
1.51	1.51	1.51	1.51
1.52	1.52	1.52	1.52
1.53	1.53	1.53	1.53
1.54	1.54	1.54	1.54
1.55	1.55	1.55	1.55
1.56	1.56	1.56	1.56
1.57	1.57	1.57	1.57
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1.59	1.59	1.59	1.59
1.60	1.60	1.60	1.60
1.61	1.61	1.61	1.61
1.62	1.62	1.62	1.62
1.63	1.63	1.63	1.63
1.64	1.64	1.64	1.64
1.65	1.65	1.65	1.65
1.66	1.66	1.66	1.66
1.67	1.67	1.67	1.67
1.68	1.68	1.68	1.68
1.69	1.69	1.69	1.69
1.70	1.70	1.70	1.70
1.71	1.71	1.71	1.71
1.72	1.72	1.72	1.72
1.73	1.73	1.73	1.73
1.74	1.74	1.74	1.74
1.75	1.75	1.75	1.75
1.76	1.76	1.76	1.76
1.77	1.77	1.77	1.77
1.78	1.78	1.78	1.78
1.79	1.79	1.79	1.79
1.80	1.80	1.80	1.80
1.81	1.81	1.81	1.81
1.82	1.82	1.82	1.82
1.83	1.83	1.83	1.83
1.84	1.84	1.84	1.84
1.85	1.85	1.85	1.85
1.86	1.86	1.86	1.86
1.87	1.87	1.87	1.87
1.88	1.88	1.88	1.88
1.89	1.89	1.89	1.89
1.90	1.90	1.90	1.90
1.91	1.91	1.91	1.91
1.92	1.92	1.92	1.92
1.93	1.93	1.93	1.93
1.94	1.94	1.94	1.94
1.95	1.95	1.95	1.95
1.96	1.96	1.96	1.96
1.97	1.97	1.97	1.97
1.98	1.98	1.98	1.98
1.99	1.99	1.99	1.99
2.00	2.00	2.00	2.00

REACTION/MOMENTUM INDEX (CONT'D)

REACTING WITH TOXINS

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

Figure 10-10-10

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTORS TO GO TO WORK

[illegible]

SECTION TWO CONT.

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

REACTIONS 2993 TO 3293

REACTION	REACTION INDEX	REACTION INDEX	REACTION INDEX	REACTION INDEX
2.10	2.10	2.10	2.10	2.10
2.11	2.11	2.11	2.11	2.11
2.12	2.12	2.12	2.12	2.12
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2.14	2.14	2.14	2.14	2.14
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2.21	2.21	2.21	2.21	2.21
2.22	2.22	2.22	2.22	2.22
2.23	2.23	2.23	2.23	2.23
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2.26	2.26	2.26	2.26	2.26
2.27	2.27	2.27	2.27	2.27
2.28	2.28	2.28	2.28	2.28
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2.31	2.31	2.31	2.31	2.31
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2.35	2.35	2.35	2.35	2.35
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2.38	2.38	2.38	2.38	2.38
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2.40	2.40	2.40	2.40	2.40
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2.99	2.99	2.99	2.99	2.99
3.00	3.00	3.00	3.00	3.00

REACTING, 1978 TO 1997

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

[illegible]

REACTION/MOMENT INDEX (CONT'D)

NOTES: SEE P. 100

REF. NO.	REMARKS	REF. NO.	REMARKS	REF. NO.	REMARKS	REF. NO.	REMARKS
101	101	102	102	103	103	104	104
105	105	106	106	107	107	108	108
109	109	110	110	111	111	112	112
113	113	114	114	115	115	116	116
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489	489	490	490	491	491	492	492
493	493	494	494	495	495	496	496
497	497	498	498	499	499	500	500

REACTANTS 5734 TO 5822

REACTION/MOMENTUM INDEX (CONT'D)

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

RECEIVED 1998 05 20

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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REACTION TYPE: CONDENSATION

[illegible]

REACTION/MOMENTUM INDEX (CONT'D)

品名	単位	数量	金額	品名	単位	数量	金額
1. 小麦	kg	100	1000	2. 大豆	kg	50	500
3. 米	kg	200	2000	4. 雑穀	kg	30	300
5. 麦	kg	80	800	6. 粟	kg	40	400
7. 稗	kg	20	200	8. 黍	kg	10	100
9. 高粱	kg	60	600	10. 玉米	kg	150	1500
11. 水稻	kg	180	1800	12. 小麦	kg	100	1000
13. 大豆	kg	50	500	14. 雑穀	kg	30	300
15. 麦	kg	80	800	16. 粟	kg	40	400
17. 稗	kg	20	200	18. 黍	kg	10	100
19. 高粱	kg	60	600	20. 玉米	kg	150	1500
21. 水稻	kg	180	1800	22. 小麦	kg	100	1000
23. 大豆	kg	50	500	24. 雑穀	kg	30	300
25. 麦	kg	80	800	26. 粟	kg	40	400
27. 稗	kg	20	200	28. 黍	kg	10	100
29. 高粱	kg	60	600	30. 玉米	kg	150	1500
31. 水稻	kg	180	1800	32. 小麦	kg	100	1000
33. 大豆	kg	50	500	34. 雑穀	kg	30	300
35. 麦	kg	80	800	36. 粟	kg	40	400
37. 稗	kg	20	200	38. 黍	kg	10	100
39. 高粱	kg	60	600	40. 玉米	kg	150	1500
41. 水稻	kg	180	1800	42. 小麦	kg	100	1000
43. 大豆	kg	50	500	44. 雑穀	kg	30	300
45. 麦	kg	80	800	46. 粟	kg	40	400
47. 稗	kg	20	200	48. 黍	kg	10	100
49. 高粱	kg	60	600	50. 玉米	kg	150	1500
51. 水稻	kg	180	1800	52. 小麦	kg	100	1000
53. 大豆	kg	50	500	54. 雑穀	kg	30	300
55. 麦	kg	80	800	56. 粟	kg	40	400
57. 稗	kg	20	200	58. 黍	kg	10	100
59. 高粱	kg	60	600	60. 玉米	kg	150	1500
61. 水稻	kg	180	1800	62. 小麦	kg	100	1000
63. 大豆	kg	50	500	64. 雑穀	kg	30	300
65. 麦	kg	80	800	66. 粟	kg	40	400
67. 稗	kg	20	200	68. 黍	kg	10	100
69. 高粱	kg	60	600	70. 玉米	kg	150	1500
71. 水稻	kg	180	1800	72. 小麦	kg	100	1000
73. 大豆	kg	50	500	74. 雑穀	kg	30	300
75. 麦	kg	80	800	76. 粟	kg	40	400
77. 稗	kg	20	200	78. 黍	kg	10	100
79. 高粱	kg	60	600	80. 玉米	kg	150	1500
81. 水稻	kg	180	1800	82. 小麦	kg	100	1000
83. 大豆	kg	50	500	84. 雑穀	kg	30	300
85. 麦	kg	80	800	86. 粟	kg	40	400
87. 稗	kg	20	200	88. 黍	kg	10	100
89. 高粱	kg	60	600	90. 玉米	kg	150	1500
91. 水稻	kg	180	1800	92. 小麦	kg	100	1000
93. 大豆	kg	50	500	94. 雑穀	kg	30	300
95. 麦	kg	80	800	96. 粟	kg	40	400
97. 稗	kg	20	200	98. 黍	kg	10	100
99. 高粱	kg	60	600	100. 玉米	kg	150	1500

REACTION/MOMENTUM INDEX (CONT'D)

REACTIVE 204 TO 209

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85															

REACTION/MOMENTUM INDEX (CONT'D)

REACTION 300 (CONT.)

PI- R 300 (CONT.)	PI- R 300 (CONT.)	PI- R 300 (CONT.)	PI- R 300 (CONT.)
PI- R 300 (CONT.)	PI- R 300 (CONT.)	PI- R 300 (CONT.)	PI- R 300 (CONT.)
1.08	1.08	1.08	1.08
1.09	1.09	1.09	1.09
1.10	1.10	1.10	1.10
1.11	1.11	1.11	1.11
1.12	1.12	1.12	1.12
1.13	1.13	1.13	1.13
1.14	1.14	1.14	1.14
1.15	1.15	1.15	1.15
1.16	1.16	1.16	1.16
1.17	1.17	1.17	1.17
1.18	1.18	1.18	1.18
1.19	1.19	1.19	1.19
1.20	1.20	1.20	1.20
1.21	1.21	1.21	1.21
1.22	1.22	1.22	1.22
1.23	1.23	1.23	1.23
1.24	1.24	1.24	1.24
1.25	1.25	1.25	1.25
1.26	1.26	1.26	1.26
1.27	1.27	1.27	1.27
1.28	1.28	1.28	1.28
1.29	1.29	1.29	1.29
1.30	1.30	1.30	1.30
1.31	1.31	1.31	1.31
1.32	1.32	1.32	1.32
1.33	1.33	1.33	1.33
1.34	1.34	1.34	1.34
1.35	1.35	1.35	1.35
1.36	1.36	1.36	1.36
1.37	1.37	1.37	1.37
1.38	1.38	1.38	1.38
1.39	1.39	1.39	1.39
1.40	1.40	1.40	1.40
1.41	1.41	1.41	1.41
1.42	1.42	1.42	1.42
1.43	1.43	1.43	1.43
1.44	1.44	1.44	1.44
1.45	1.45	1.45	1.45
1.46	1.46	1.46	1.46
1.47	1.47	1.47	1.47
1.48	1.48	1.48	1.48
1.49	1.49	1.49	1.49
1.50	1.50	1.50	1.50
1.51	1.51	1.51	1.51
1.52	1.52	1.52	1.52
1.53	1.53	1.53	1.53
1.54	1.54	1.54	1.54
1.55	1.55	1.55	1.55
1.56	1.56	1.56	1.56
1.57	1.57	1.57	1.57
1.58	1.58	1.58	1.58
1.59	1.59	1.59	1.59
1.60	1.60	1.60	1.60
1.61	1.61	1.61	1.61
1.62	1.62	1.62	1.62
1.63	1.63	1.63	1.63
1.64	1.64	1.64	1.64
1.65	1.65	1.65	1.65
1.66	1.66	1.66	1.66
1.67	1.67	1.67	1.67
1.68	1.68	1.68	1.68
1.69	1.69	1.69	1.69
1.70	1.70	1.70	1.70
1.71	1.71	1.71	1.71
1.72	1.72	1.72	1.72
1.73	1.73	1.73	1.73
1.74	1.74	1.74	1.74
1.75	1.75	1.75	1.75
1.76	1.76	1.76	1.76
1.77	1.77	1.77	1.77
1.78	1.78	1.78	1.78
1.79	1.79	1.79	1.79
1.80	1.80	1.80	1.80
1.81	1.81	1.81	1.81
1.82	1.82	1.82	1.82
1.83	1.83	1.83	1.83
1.84	1.84	1.84	1.84
1.85	1.85	1.85	1.85
1.86	1.86	1.86	1.86
1.87	1.87	1.87	1.87
1.88	1.88	1.88	1.88
1.89	1.89	1.89	1.89
1.90	1.90	1.90	1.90
1.91	1.91	1.91	1.91
1.92	1.92	1.92	1.92
1.93	1.93	1.93	1.93
1.94	1.94	1.94	1.94
1.95	1.95	1.95	1.95
1.96	1.96	1.96	1.96
1.97	1.97	1.97	1.97
1.98	1.98	1.98	1.98
1.99	1.99	1.99	1.99
2.00	2.00	2.00	2.00

REACTION TIME INDEX

REACTION/MOMENTUM INDEX (CONT'D)

REACTION TIME INDEX	REACTION TIME INDEX	REACTION TIME INDEX	REACTION TIME INDEX
1.01	1.02	1.03	1.04
1.05	1.06	1.07	1.08
1.09	1.10	1.11	1.12
1.13	1.14	1.15	1.16
1.17	1.18	1.19	1.20
1.21	1.22	1.23	1.24
1.25	1.26	1.27	1.28
1.29	1.30	1.31	1.32
1.33	1.34	1.35	1.36
1.37	1.38	1.39	1.40
1.41	1.42	1.43	1.44
1.45	1.46	1.47	1.48
1.49	1.50	1.51	1.52
1.53	1.54	1.55	1.56
1.57	1.58	1.59	1.60
1.61	1.62	1.63	1.64
1.65	1.66	1.67	1.68
1.69	1.70	1.71	1.72
1.73	1.74	1.75	1.76
1.77	1.78	1.79	1.80
1.81	1.82	1.83	1.84
1.85	1.86	1.87	1.88
1.89	1.90	1.91	1.92
1.93	1.94	1.95	1.96
1.97	1.98	1.99	2.00
2.01	2.02	2.03	2.04
2.05	2.06	2.07	2.08
2.09	2.10	2.11	2.12
2.13	2.14	2.15	2.16
2.17	2.18	2.19	2.20
2.21	2.22	2.23	2.24
2.25	2.26	2.27	2.28
2.29	2.30	2.31	2.32
2.33	2.34	2.35	2.36
2.37	2.38	2.39	2.40
2.41	2.42	2.43	2.44
2.45	2.46	2.47	2.48
2.49	2.50	2.51	2.52
2.53	2.54	2.55	2.56
2.57	2.58	2.59	2.60
2.61	2.62	2.63	2.64
2.65	2.66	2.67	2.68
2.69	2.70	2.71	2.72
2.73	2.74	2.75	2.76
2.77	2.78	2.79	2.80
2.81	2.82	2.83	2.84
2.85	2.86	2.87	2.88
2.89	2.90	2.91	2.92
2.93	2.94	2.95	2.96
2.97	2.98	2.99	3.00
3.01	3.02	3.03	3.04
3.05	3.06	3.07	3.08
3.09	3.10	3.11	3.12
3.13	3.14	3.15	3.16
3.17	3.18	3.19	3.20
3.21	3.22	3.23	3.24
3.25	3.26	3.27	3.28
3.29	3.30	3.31	3.32
3.33	3.34	3.35	3.36
3.37	3.38	3.39	3.40
3.41	3.42	3.43	3.44
3.45	3.46	3.47	3.48
3.49	3.50	3.51	3.52
3.53	3.54	3.55	3.56
3.57	3.58	3.59	3.60
3.61	3.62	3.63	3.64
3.65	3.66	3.67	3.68
3.69	3.70	3.71	3.72
3.73	3.74	3.75	3.76
3.77	3.78	3.79	3.80
3.81	3.82	3.83	3.84
3.85	3.86	3.87	3.88
3.89	3.90	3.91	3.92
3.93	3.94	3.95	3.96
3.97	3.98	3.99	4.00

REACTION/MOMENTUM INDEX (CONT'D)

REUTERS, 1997-1998

[illegible]

PART III
VOCABULARIES

PARTICLE VOCABULARY

Discussion

There are about 300 distinct particle names appearing in this report, counting all charge states. In this vocabulary we provide lists of the names of these particles, ordered both alphabetically and by particle type.

Particle-type order is as follows: photons, leptons, non-strange-mesons, strange mesons, charmed mesons, a few generic mesons, baryons in the order Σ^0 , $-\Lambda$, -2 , -3 , $+1$, $+2$, some special baryons, nuclei, and finally, some other special particles, such as .CT.SPONG. Within each category, particles are ordered by increasing mass.

Most particle names are as used in the Review of Particle Properties (Reviews of Modern Physics 51, No. 2, Part II, April 1980) and require no special explanation. For baryon names, we have a convention: NAME(MASS L ISPIN [M]OMAGN), where "ISPIN" is equal to 1 for Integral Isospin and 2 if otherwise, e.g., DEL(1690P13)++; if some of the quantum numbers are uncertain, a B (for bump) may follow the MASS, e.g., DEL(1930B)++. Mesons are given their vernacular names. If the particle has only a neutral state (e.g., LAMBDA) or the charge is unspecified (e.g., PION), no charge is given. The antiparticles of all baryons, neutral leptons, and neutral strange or charmed mesons are formed by prefixing the particle name with an "A". The charge is that of the antiparticle, so that, for example, $\bar{A}K^+$ is the antiparticle for K^+ .

If there is more than one occurrence of a particle in a final state, the number of occurrences is prefixed to the particle name (e.g., $2P^+$). Where the exact number of such particles is unknown, but a lower limit to the number is given, our convention, illustrated for π^0 's, is as follows: (PION) means "0 or more π^0 's"; PION1, "1 or more π^0 's"; PION, "2 or more π^0 's".

The "particle" ANYTHING is used to mean "the particles listed plus anything else": for example, P^+ ANYTHING refers to inclusive π^+ channels, while just ANYTHING in the final state refers to total cross-section measurements.

The special "particles" DD and NON-RES are accompanied, when written in reactions, by angular brackets containing the diffractively dissociated

or non-resonant final states. For example, $P^+ P^- \rightarrow P^0 D \langle 2P^+ P^- \rangle$ means that the P^+ beam dissociates diffractively into $2P^+ P^-$; $P^+ P^- \rightarrow \text{NON-RES} \langle P^+ P^- \rangle$ indicates the non-resonant part of the reaction $P^+ P^- \rightarrow P^+ P^-$.

Ambiguities

There are ambiguities in our particle names, especially for generic names. For example, STRANGE and RES can be ambiguous; in principle, the first refers to neutral strange particles, detected or not, while the second refers only to those detected as one decays in track-sensitive detectors. Some ambiguities are historical in origin, caused by changes in nomenclature as particle properties become better determined. For example, the early searches for heavy leptons were encoded using the generic name $\bar{\nu}\bar{\nu}$ -LEPTON, but some recent papers are encoded using $\bar{\nu}\bar{\nu}$; what one paper refers to as DEL(1890B)+ might be referred to in other papers as DEL(1890P13)+, and so on. Ambiguity names usually appear close together in the type-ordered vocabulary list, and it is suggested that this list be consulted if an ambiguity could exist.

PARTICLES ORDERED ALPHABETICALLY

ADEL0 C= ADEL(123P110)
 ADEL- C= ADEL(123P11-)
 ADEL== C= ADEL(123P11==)
 ADO C= CHARGED PARTICLE CANDIDATE
 AG C= SILVER NUCLEUS
 ANYFERON C= GENERAL ANTI-NEUTRINO
 AKAFFA(1230) C= AKFI S-WAVE
 AKB(1800) C= AKFI S-WAVE
 AKFI(330)++
 AKFME(1400) C= J_P=0- STATE SEEN IN PMA BY BRANDENBURG N₂ DECAYING PREDOMINANTLY INTO EPSILON K0
 AKO
 AK*(1430) C= ALUMINUM NUCLEUS
 AK*(892)0
 AL C= ALUMINUM NUCLEUS
 ALORIDA
 ALAM(140500) C= ANTI-4,(1770)0
 ALAM(132000) C= ANTI-NEUTRON
 AL(1770)0 C= ANTI-NUCLEON NUCLEON I=0 INITIAL STATE (AND ELASTIC FINAL STATE)
 AM C= ANTI-NUCLEON NUCLEON I=0 INITIAL STATE (AND ELASTIC FINAL STATE)
 AMN(I=0) C= NARROW S AS STATE
 AMN(1905)0 C= NARROW S AS STATE
 AMO
 ANYTHING C= FOR USE IN INCLUSIVE REACTIONS, ALSO FOR CROSS-SECTION DATA, AS IN E+P -> ANYTHING
 AR(1470)=
 ARMDG+
 AR C= 3F1 STATE
 ARDHC(1800)+ C= 3F1 STATE
 ARDHC(1800)- C= 3F1 STATE
 ARQ(1240+1400)0
 AS10NA0 AS10NA+ AS10NA-
 AS2C(1383P1)0 AS2C(1383P1)+ AS2C(1383P1)-
 AU C= GOLD NUCLEUS
 AX0
 AX0+
 A1(1100)0 A1(1100)+ A1(1100)-
 A1.5(1170)+ A1.5(1170)-
 A1(1310)0 A1(1310)+ A1(1310)-
 A3(1440)0 A3(1440)+ A3(1440)-
 A4(1900)+ A4(1900)-
 A-BECCON C= BECCON AROUND A1 AND A2
 BE C= BERYLLIUM NUCLEUS
 B(123)0 B(123)+ B(123)-
 C C= CARBON NUCLEUS
 CC C= CHARGE CONJUGATE REACTION
 CHARGED C= A CHARGED TRACE ORIGINATING FROM THE PRIMARY INTERACTION. ANSWERS OBSERVED OR UNOBSERVED NEUTRALS MAY BE PRESENT, BUT ARE IGNORED UNLESS SPECIFICALLY MENTIONED.
 CHARGED+ C= POSITIVE CHARGED PARTICLE
 CHARGED- C= NEGATIVE CHARGED PARTICLE
 CU C= COPPER NUCLEUS

DD C= DIFFRACTION DISSOCIATION. TO BE FOLLOWED BY NAMES OF PARTICLES WHICH WERE PRODUCED VIA DIFFRACTION DISSOCIATION. E.G. DD <P P0>
 DELTA(980)0 DELTA(980)+ DELTA(980)-
 DEL0 C= DEL(123P110)
 DEL+ C= DEL(123P11+)
 DEL== C= DEL(123P11==)
 DEL- C= DEL(123P11-)
 DEL(UNSPEC)+ C= 1/2 BAYTON OF UNSPECIFIED MASS, USE PRIMARILY IN PROP, RVOL, COMP
 DEL(1450)0
 DEL(1470)0
 DEL(1690)0
 DEL(1690)++ C= BUMP IN PRODUCTION EXPERIMENT
 DEL(1880)++
 DEL(1890)0
 DEL(1890)33++
 DEL(1950)0
 DEL(1950P3)+
 DEL(2420)++
 DEL(2830)++
 DEUT DEUT*(2170)0 DEUT*(2170)+ DEUT*(2170)-
 D0 C= CHARGED PARTICLE CANDIDATE
 D+ C= CHARGED PARTICLE CANDIDATE
 D- C= CHARGED PARTICLE CANDIDATE
 D(1205)
 EPSILON(700) C= POSI S-WAVE (NEAR 700 MEV)
 E+ C= POSITRON
 E- C= ELECTRON
 E(1420)
 F C= F(1270) NUCLEON RESONANCE
 FS C= FION NUCLEUS
 F(1540)0 F(1540)+
 GAMMA C= VIRTUAL GAMMA
 GAMMA C(1700)+ C(1700)-
 GADRON C= SINGLE GADRON, ANY CHARGE OR MASS
 GADRON C= TWO OR MORE GADRON
 GADRON+ C= CHARGE + GADRON
 GADRON- C= CHARGE - GADRON
 GE C= HELIUM-4 NUCLEUS
 HYPERON C= GENERAL HYPERON
 HYPERON C= GENERAL HYPERON OF CHARGE 0
 H(2040) C= H=0, J_P=+ NUCLEON RESONANCE
 H(980)
 INELASTIC C= SAME AS ANYTHING, EXCEPT ELASTIC EXCLUDED
 JET C= JET DETECTED AS A WHOLE
 J/P(1310)0
 K0N C= EXACTLY ONE K0N OR ANION OF UNSPECIFIED CHARGE
 K0NS C= TWO OR MORE UNSPEC K0NS
 KAPPA(1250)0 C= KPI S-WAVE
 KAPPA(1250)+ C= KPI S-WAVE

EXCEPT CHANGE IS SPECIFIED
 STRANGE(S) C= ONE OR MORE UNSPECIFIED STRANGE PARTICLES
 S*(999) C= FIPI OR XRAY S-WAVE
 T1 C= TITANIUM NUCLEUS
 T1(2190)+ C= THORIUM NUCLEUS
 U C= URANIUM NUCLEUS
 UPSI(10020) C= UPSILON(10020)
 UPSI(1940) C= UPSILON(940)
 U(2400) C= SEEN UNSPECIFIED NEUTRAL STRANGE PARTICLE DECAY
 V C= VECTOR MESON SEEN IN PHOTOPRODUCTION
 V(1110) C= INTERMEDIATE VECTOR BOSON
 W C= TUNGSTEN NUCLEUS --- NOTE NAME IS NOT SAME AS
 WT CHEMICAL SYMBOL
 X C= XI(1310) OF UNSPECIFIED CHARGE
 X1 C= Y=-1 BARYON OF UNSPEC MASS, I
 X1(UNSPEC)= C= 1/2, Y=-1 BARYON OF UNSPEC MASS
 X1(UNSPEC) C= 1/2, Y=-1 BARYON OF UNSPEC MASS
 X1(1330)110 X1(1330)11-
 X1(1630)0 X1(1630)-
 X1(1820)0 X1(1820)-
 X1(1940)0 X1(1940)-
 X1(2030)0 X1(2030)-
 X(2300-3600) C= ANY MESON BOMP SEEN IN PRODUCTION EXPERIMENTS IN
 THAT MASS REGION (EXCEPT THOSE ASSOCIATED WITH
 J/PSI, ETC.)
 X(2830) C= JP=0- CHARMONIUM STATE
 X(1900)+ C= EXOTIC [u], T=0 BARYON
 X(UNSPEC) C= 6 PIONS OR MORE
 X(UNSPEC) C= 6 PIONS OR MORE
 X(UNSPEC) C= 8 PIONS OR MORE
 X(UNSPEC) C= MORE THAN 3 PIONS
 X(UNSPEC) C= MORE THAN 3 PIONS
 X(UNSPEC) C= MORE THAN 7 PIONS
 X(UNSPEC) C= MORE THAN 9 PIONS

PARTICLES ORDERED BY TYPE

GAMMA
 GAMMA+ C= VIRTUAL GAMMA
 NO
 NO
 E+ C= ELECTRON
 E- C= POSITRON
 MU+
 GE, PFION C= 8 OR MORE PIONS
 GE, PFION C= 6 OR MORE PIONS
 PION(S) C= ONE OR MORE PIONS
 PION C= TWO OR MORE PIONS
 PION C= EXACTLY ONE PION OF UNSPECIFIED CHARGE
 PION(S) C= 1 OR MORE PION
 PION C= 2 OR MORE PION
 PI+ PI-
 ETA
 EPSILON(700) C= FIPI S-WAVE (NEAR 700 MEV)
 RHO+ RHO-
 RHO C= UNSPECIFIED RHO(770) MESON
 OMEGA C= MESON RESONANCE
 W(940) C= NON-STRANGE, T=0 MESON RESONANCE
 ETA PRIME
 DELTA(980)+ DELTA(980)0 DELTA(980)-
 S*(980) C= FIPI OR XRAY S-WAVE
 W(980)
 PSI
 A1(100)+ A1(1000)+ A1(1000)-
 A-RESCON C= RESON ABOVE A1 AND A2
 V(1110) C= VECTOR MESON SEEN IN PHOTOPRODUCTION
 A1-9(1170)+ A1-9(1170)- B(1235)-
 B(1235)+ B(1235)0
 RHO PRIME(1235)0 C= F(1270) MESON RESONANCE
 F
 D(1285)
 A2(1310)+ A2(1310)-
 S(1420)
 F PRIME
 F(1340)+ F(1340)0
 RHO PRIME(1400)+ RHO PRIME(1400)0 RHO PRIME(1400)-
 A3(1660)+ A3(1660)0 A3(1660)-
 OMEGA(1670) C= MESON RESONANCE
 G(1700)+ G(1700)0 G(1700)-
 A PRIME(1800)+ A PRIME(1800)-
 A PRIME(1800)+ A PRIME(1800)-
 A(1900)+ A(1900)-
 S(1900)+
 ANH(1915)0 C= NARROW N AN STATE
 H(2040) C= 1=0, JP=4+ MESON RESONANCE
 T(2190)+
 U(2400)+
 X(2500-3600) C= ANY MESON BOMP SEEN IN PRODUCTION EXPERIMENTS IN
 THAT MASS REGION (EXCEPT THOSE ASSOCIATED WITH
 J/PSI, ETC.)

KINEMATIC VARIABLE VOCABULARY

The following material is a modified form of Appendix B8 from the "Particle Physics Data System Reaction Data File Recording Manual," the entire manual can be found on a special fiche included with this report.

A word on notation: Angular brackets, < and >, are used below to enclose any variable which may take on various literal values; the brackets themselves are not actually encoded. Also, values written in all capital letters are literals which are encoded just as they appear.

Introduction

The names of independent kinematic variables are referred to as x-names. These appear in various places throughout each Data Listing entry:

- 1) To define each data point in an entry, in addition to the dependent variable name (y-name) and reaction, at least one independent variable must be specified.
- 2) X-names (and more often y-names) are also used to define what variable a systematic error applies to or under what conditions it applies.
- 3) Finally, the names of some dependent variables (y-names) are constructed using x-names as some of their components (see the Observables Vocabulary).

The number of independent variables that have been used to describe high energy physics experimental data is very large. To cope with this diversity, we have defined a syntax for constructing x-names.

The y-name syntax consists of the following elements and rules for combining elements:

- 1) There is a list of basic x-names around which all x-names are built; examples from this list include ENERGY, E, E, P, etc. (the full list is given below).
- 2) For each basic x-name, there are defined a number of arguments (the number differs for different basic x-names), which are used to specify the variable precisely (the structure and functions of arguments are discussed in detail below).
- 3) X-names of variables which are simply related to those constructed using elements 1) and 2) can be formed using FORTHAN-like operators such as SIN, COS, SQRT, etc. (a full list is given below).

4) X-names of even more complex variables may be created by the use of operators such as +, -, *, /, **, etc. as in FORTHAN (the full list of operators is given below).

5) Finally, aliases may be combined with x-names constructed from rules 1) - 4) above by using any of the operators defined in 3) and 4).

If an x-name cannot be constructed from the x-name syntax, then that x-name is written in free format. This has the following form: /<free format>. This form is to be used whether the x-name which cannot be encoded in the x-name syntax is the entire name or just part of it, as in, say, a y-name. In the latter case, the entire y-name must be written in free format.

In the remainder of this Vocabulary, we discuss the x-name syntax in much greater detail, presenting complete lists of basic x-names, all possible arguments, and operators. And finally we give examples to illustrate how the syntax is used.

X-name Argument Structure

The simplest form of an x-name with arguments is the following:

```
<basic-x-name>(<arg-name1>=<arg-value1>,  
               <arg-name2>=<arg-value2>,...)
```

where:

- 1) <basic-x-name> is one of the names from the Table of Basic X-names presented below.
- 2) <arg-name> is the name of any argument permitted for this particular basic x-name; the permissible arguments and their defaults (if any) are given in the Table of Basic X-names. The list of all possible argument names and their meanings is given in a separate section below.
- 3) <arg-value> is the value of the argument. The form depends on the argument type and is discussed in the section in which all argument types are presented.

The following general remarks apply to arguments:

- 1) Arguments may appear in any order.
- 2) Any argument for which a default value is given in the Basic X-name Table below may be omitted if the default is applicable, e.g., DISIC/DI may appear instead of DISIC/DI(P=0,P=1).
- 3) If all arguments have been omitted, then the left and right

parentheses may have been dropped also.

The purpose of arguments to basic x-names is to supply information which, when combined with the basic name, completely specifies the independent variable.

The Types of Arguments and Their Meanings

- 1) P: The form P... is used to specify: a) the particle (or system of particles) whose property (momentum, energy, angle, etc.) is being reported; or b) the momentum, or momentum direction, of a particle (or system of particles) needed in the definition of a variable.
- 2) X,Y,Z: These three arguments are needed for some variables to define a right-handed system of coordinate axes for reference. The values of these arguments are the particles (or systems of particles) whose momentum vectors define the appropriate directions (see below for how these values are encoded). For certain coordinate axes, X,Y,Z may be replaced by XYZ; see next.
- 3) XYZ: This single argument is used instead of the three X,Y,Z arguments for those cases for which we have defined an abbreviation to specify some of the more common coordinate systems; see the 'Special Coordinate Systems' section below.
- 4) RP: This argument indicates the particle (or system of particles) in whose rest frame the measured quantity is reported.
- To understand how P, X, Y, Z, and RP are encoded, see the 'Specifying Particles and Directions' section below.
- 5) NAME: Occasionally, a variable has an accepted name which can be given. This arises more often with y-names.
- 6) DEF: This argument can be used to define unambiguously a variable (such as E_L) which has more than one definition in common use.
- 7) Q: This qualifier is a special, rarely used, "labeling" or "linking" argument. Its use is confined to the following circumstances: When a y-name is composed of more than one basic y-name, and there is ambiguity as to which x-name values are associated with which basic y-name, this ambiguity is resolved by giving the basic y-name and relevant x-name the same, arbitrary (possibly mnemonic) value for the Q argument. An example might be:

$$(\sin^2 \theta^{\text{CM}} / s) / (d\sigma/d^2\theta / s).$$

This is encoded (suppressing arguments and variables not relevant to this discussion) as follows:

```
x-name1 = THETA(Q=1) IN DEG,    x-value1 = 90,
x-name2 = THETA(Q=2) IN DEG,    x-value2 = 0,
y-name = (D(SIG(Q=1))/DT)/(Q(SIG(Q=2))/DT).
```

The Q argument is only used in cases where there is ambiguity, and for each such ambiguity a different Q value is required. Any convenient character(s) may be used for the value of Q.

This argument is used also in the situation where more than one reaction is needed to characterize a measurement, as in the case of ratios of cross sections of reactions, and there is ambiguity as to which reaction the y-name in question applies to. E.g.:

```
x-name1 = RE(Q=EL),            x-value1 = P P -> P P,
x-name2 = RE(Q=TOT),          x-value2 = P P -> ANYTHING,
y-name = (D(SIG(Q=EL))/DT)/(SIG(Q=TOT) IN GB**Q).
```

Specifying Particles and Directions

P,X,Y,Z,RP: The value of any one of these arguments specifies a particle (or system of particles) in the reaction, or the direction of the momentum of the particle (or system of particles), or the momentum itself. In all these cases, the particle (or system of particles) is encoded in the same way: each particle (or its momentum) is represented by a number corresponding to the position of the particle in the reaction (see below), and each system of particles is represented by the sequence of numbers assigned to the particles which comprise the system. Directions not expressible directly in terms of a particle's (or system of particles') momentum are expressed using notation and/or by construction of appropriate cross products as discussed below. The rules for constructing any value for the above-listed arguments are given, in more detail, by the following:

- a) Particles are numbered from left to right as written in the reaction (starting with the beam), with every different particle given one successively higher number without regard to whether the particle is a primary particle in the reaction or is a decay product. Multiply occurring particles encoded with a number preceding the name (A-1, ZIAXXA) are treated as the corresponding number of $\sqrt{s}/2$ particles for

the purpose of numbering.

In the reaction-data file "reaction spotx" (see the guide at the beginning of the Reaction/Momentum Index), it is possible to encode as a single reaction occurrence, reactions which consist of a sum or difference over particles in the final state. In these cases, all particles are numbered from left to right regardless of whether there are sums or not. Thus the reaction

$P1 \rightarrow P2 \rightarrow E2 \text{ (SIGMA)} + \text{LAMBDA } P10$

is numbered as

$P1 \rightarrow P2 \rightarrow E2 \text{ (SIGMA)} + \text{LAMBDA } P10.$

1 2 3 4 5 6

In this scheme, the independent variable arguments contain the information about the sum over states and are written, e.g., as $T(P4 + 5 \text{ 5, } P=1)$ for the momentum transfer from the proton to the final SIGMA or (LAMBDA P10) system.

b) A single particle, or the direction defined by its momentum in some frame (specified by RF), or its momentum, is encoded simply by giving the number corresponding to its order in the reaction (see a) above).

c) A system of particles is specified by writing the sequence of numbers corresponding to all the particles in the system, the numbers being separated by blanks.

d) The negative of any direction is specified by preceding the particle number by a minus. If a system of particles is involved, the sequence of numbers specifying the system will be preceded by a minus sign.

e) Cross products: In specifying an axis, it may be necessary to refer to a direction which is a cross product of the directions of two particles (or systems of particles); in such a case the cross product is expressed by a *. Thus the direction defined by the cross product of particles 1 and 3 (i.e., the normal to the production plane) is given by 1*3. The cross product of particle 1 and the system 3 + 4 is written 1*4 (or 1*(3 4) if desired, for readability). The negative of the preceding direction is encoded -1*4. A triple cross product is assumed to be evaluated from the left. Thus 1*2 4*3 5 is assumed to be (1*2 4)*3 5 = ((1*2 4))*3 5).

f) Special cases for RF: Since the beam and target are always

numbered 1 and 2, respectively, the lab and CM frames are given in terms of particle numbers as RF=1 and RF=2, respectively. For these cases, the forms RF=LAB and RF=CM, respectively, are also allowed.

g) Spin direction: The direction of spin of a particle is specified by preceding the particle number by S; e.g., S2 represents the direction of spin of particle 2. If a system of particles is involved, as in the case of the direction of spin of, say, a $\pi\pi$ system, the particle number of each particle will be preceded by S.

Special Coordinate Systems

The following is a list of special coordinate systems, their abbreviations, and their definitions, which have been defined for the MYE argument:

XYZ = SR	s-channel helicity frame
TS	t-channel helicity frame (Oscified-Jackson)
ST	s-channel transversality frame
TT	t-channel transversality frame
ADAIR	Adair frame

FORTHAN-like Operators

In the following, <arg> is any valid x-name or y-name, either basic or constructed following the x-name or y-name syntax.

Operator	Meaning
SIN(<arg>)	trigonometric sine
COS(<arg>)	trigonometric cosine
ABS(<arg>)	absolute value or modulus
LN(<arg>)	natural logarithm
LOG(<arg>)	common logarithm
ATAN(<arg>)	arc tangent, defined to be in the range $(-\pi/2, \pi/2)$
RE(<arg>)	the real part of a complex argument (Note, usage differs from FORTHAN.) (Does not apply to x-name, may apply to y-name.)
IM(<arg>)	the imaginary part of a complex argument (Note, usage differs from FORTHAN.) (Does not apply to x-name, may apply to

y=name.)
 + addition
 - subtraction
 * multiplication
 / division
 ** exponentiation
 EXP (xarg) exponentiation

"PI" may appear as a constant; e.g., 2*PI*COS(THETA).

Table of Basic X-names

Basic Variable Name	Arguments with Default Values (? means no default defined)	Meaning
P E ECIN	(P=1, RF=LAB)	$\left\{ \begin{array}{l} \text{momentum} \\ \text{energy} \\ \text{kinetic energy} \end{array} \right.$
S W or N	(P=1, 2)	$\left\{ \begin{array}{l} S = (P_1^2 + P_2^2)^{1/2} \text{ Invariant mass squared} \\ W = \sqrt{s} \text{ energy of system of particles or invariant mass of single particles} \end{array} \right.$
THETA OMEGA	(P=1, P=1, RF=CM)	$\left\{ \begin{array}{l} \theta = \text{polar angle } (0^\circ \text{ to } 180^\circ) \\ d\Omega = 2\pi d(\cos\theta) \end{array} \right.$
PHI	(P=1, S=1*P1, P=1*P2, Z=1, RF=CM)	$\phi = \text{azimuthal angle}$
T TP	(P=1, P=1)	$\left\{ \begin{array}{l} t = (p_1 - p_2)^2 \text{ Invariant momentum transfer squared} \\ t' = t - t_{\min}^* - t_{\max}^* \text{ in MIN(t)} \end{array} \right.$
U UP	(P=1, P=2)	$\left\{ \begin{array}{l} u = (p_1 - p_3)^2 \\ u' = u - u_{\min}^* - u_{\max}^* \text{ in MIN(u)} \end{array} \right.$ <p>t, t', u, u' are all mostly negative</p>

Table of Basic X-names (cont'd)

Basic Variable Name	Arguments with Default Values (? means no default defined)	Meaning
NU	ν	Lepton scattering variables whose default definitions are given by the formulae: $\nu = E - E'$ $E = \frac{q^2}{2m} = \nu - \frac{Q^2}{2m}$ $Q^2 = -q^2 = 4EE' \sin^2(\frac{\theta}{2})$ $\epsilon = [1 + 2(1 + \nu^2/Q^2) \tan^2(\frac{\theta}{2})]^{-1}$ $u = 2m\nu/Q^2$ $u' = 1 + u^2/Q^2 = u + \frac{m^2}{Q^2}$ $x = (\nu)^{-1}$ $x' = (\nu')^{-1}$
X	E	
Q2	Q^2	
EPS	ϵ	
OH	u	
OH'	u'	
X	x	
X'	x'	
PL		
PT		
MT		
XL	$(P=), RP=CH, DEF=2*PL/M$	$2P_L/\sqrt{s}$, Feynman x (E1)*
Some other possible definitions are:		
	$DEF=PL/P(P=), RP=CH$	P_L/P_1 (X7)*
	$DEF=PL/PMAX$	P_L/P_{max}^{CM} (X3)*
	$DEF=PL/SQRT(PMAX**2-PT**2)$	$P_L / [(p_{max}^{CM})^2 - p_T^2]^{1/2}$ (X4)*
	$DEF=2*PL/SUMPLONT$	$2P_L / \Sigma(P_L)$ (X5)*
	$DEF=1.-M**2/S$	$2E^{CM}/\sqrt{s}$ (X6)*
	$DEF=2.*Q/M$	

* Alternate and obsolete abbreviations.

Table of Basic X-names (cont'd)

Basic Variable Name	Arguments with Default Values (? means no default defined)	Meaning
XT	$(P=), RP=CH, DEF=1*PT/M$	x transverse $\frac{2P_T}{\sqrt{s}}$
XR	$(P=), RP=CH, DEF=P/PMAX$	x radial
YAP	$(P=), RP=CH$	y rapidity
YRAP	$(P=), P=1, RP=CH$	$dy = y_1 - y_2$
YRAPSC		$(y-y_2)/(y_1-y_2)$
ETAP	$(P=), DEF=T$	pseudorapidity
Where possible values are		
	$DEF=LN(TAN(THETA))$	$\ln(\tan\theta)$ implies $RP=LAB$ (ETAPN1)*
	$DEF=LN(TAN(THETA)/2)$	$\ln(\tan\frac{\theta}{2})$ implies $RP=CM$ (ETAPF2)*
	$DEF=LOG(TAN(THETA))$	$\log(\tan\theta)$ implies $RP=LAB$ (ETAPF3)*
	$DEF=LOG(TAN(THETA)/2)$	$\log(\tan\frac{\theta}{2})$ implies $RP=CM$ (ETAPF4)*
CORR	$(P=), P=1$	$C(y_1, y_2)$
SCORR	$(P=), P=1$	$R(y_1, y_2)$
		$= \left(\frac{d^2\sigma}{dy_1 dy_2} - \frac{1}{\tau_{12}} \frac{d\sigma}{dy_1} \frac{d\sigma}{dy_2} \right)$
		$= \left(\tau_{12} \frac{d^2\sigma}{dy_1 dy_2} - \frac{d\sigma}{dy_1} \frac{d\sigma}{dy_2} \right) - 1$

* Alternate and obsolete abbreviations.

Example

Consider the reaction:

$$P_1 + P_2 \rightarrow P_3 + P_4 + \pi^-$$

1 2 3 4 5 6 7

where the particle number is given below each particle in the reaction. Then

use

```

P(P=1,RF=LAB)           for beam momentum in the lab frame
: P

P(P=3,RF=5)              for the momentum of  $\pi^-$  from  $\Delta^{++}$  to  $\Delta^{++}$  frame
S(P=3,4)                  for invariant mass squared of  $(\pi^+\pi^-)$  system
S(P=1,2)                  for overall CM energy squared
: S

COS(THETA(P=3,4,P=1,RF=CM)) for cosine of polar angle between the  $\pi^+\pi^-$ 
                           state and the incoming  $\pi^+$ 

T(P=3,P=1)                for the momentum transfer from  $\pi^+$  to  $\pi^-$ 
: T

-TP(P=3,4,P=1)            for  $-t'$  between initial  $\pi^+$  and outgoing  $\pi^+\pi^-$ 
                           system

SQR((-T(P=3,P=1)))         for  $(-t)^{1/2}$  between beam and outgoing  $\pi^+$ 
SQR(-T)

T(P=3,P=1)/.02            for  $t/.02$ 

```

OBSERVABLE VOCABULARY

The following material is a modified form of Appendix IV from the "Particle Physics Data System Reaction-Data File Encoding Manual;" the entire manual can be found on a special disk included with this report.

A word on notation: Angular brackets, < and >, are used below to enclose any variable which may take on various literal values; the brackets themselves are not actually encoded. Also, values written in all caps are literals which are encoded just as they appear.

1. NAME

The name of the dependent variable, or "observable", is referred to as y -name.

Even the number of "basic" y -names, i.e., the classes of observables such as cross sections, polarizations, correlations, etc., is very large. The number of y -names actually used is overwhelmingly large since, in general, the basic observables may be reported in different reference frames and for different particles or combinations of particles. Furthermore, they are often differentiated or integrated with respect to the various independent variables on which they depend. Finally, an innumerable number of y -names may be constructed from those just described by combining them using operations such as SQR, SIN, +, -, *, /, **, or with any of the x -names defined for that observable, or with constants. In actual practice, all these variations are used. To cope with this diversity, we have defined a system for constructing y -names. This system contains all the elements of the x -name system (see the Kinematic Variable Vocabulary), plus many additional elements resulting from the much greater number of y -names constructed in practice.

The y -name system contains the following elements and rules for constructing y -names:

1) There is a list of basic y -names which defines classes of observables and around which all actual y -names are built; examples from the list include SIG, TMR, PGR, SGR, etc. (the full list is given below).

2) For each basic y -name, there are defined a number of arguments (the number differs for different basic y -names), which together with the basic y -name are sufficient to completely specify some of the more simple y -names (the structure and functions of arguments are discussed in detail

below).

3) A large class of additional y -names can be constructed from the simple y -names obtained using elements 1) and 2) by the use of FORTRAN-like operators such as SIN, COS, SQRT, etc. (a full list was given in the Kinematic Variable Vocabulary).

4) In addition to the FORTRAN-like operations defined in 3), the y -name system also includes a notation for expressing differentiation and integration. The details of how these are encoded are given below.

5) Other variations of y -names may be obtained from those which can be constructed using 1) - 4) by combining these with x -names, i.e., independent variable names (such as THETA, S, P, T, etc.), by using operators such as +, -, *, /, **, etc., and parentheses, as in FORTRAN (the full list of operators was given in the Kinematic Variable Vocabulary).

6) Other variations may be obtained by combining constants in the same manner as described in 5).

7) Finally, some y -names may be obtained by taking products, sums, differences, or ratios of y -names as defined to include all y -name features described in 1) - 6) above.

In the remainder of this Vocabulary, we discuss the y -name system in much greater detail. Wherever appropriate, we refer to the x -name system, all of which comprises part of the y -name system. We present a complete list of basic y -names, their argument structure, and default argument values; we also discuss the general rules for argument construction and for the combination of x -names, y -names, constants, and operators to construct the great variety of y -names used in practice in describing reaction data.

y -name Argument Structure

The simplest type of y -name consists of a basic y -name with (possibly) arguments. This has the following form:

```
basic-y-name(<arg-name>=<arg-value>1),  
            <arg-name>=<arg-value>2),...,  
            <arg-name>=<arg-value>N)<op>/  
            <arg-name>=<arg-value>1),  
            <arg-name>=<arg-value>2),...
```

where:

- 1) `<basic-p-name>` is one of the names from the Table of Basic Y-names presented below.
- 2) `<arg-name>` is the name of any argument permitted for this particular basic y-name; the permissible arguments and their defaults (if any) are given in the Table of Basic Y-names. The list of all possible argument names and their meanings is given in a separate section below.
- 3) `<arg-value>` is the value of the argument. The form depends on the argument type and is discussed in the section in which all argument types are presented.
- 4) `//`: for some y-names, the same set of arguments needs to be specified for more than one particle (or particle system), as in the case of joint density matrix elements and correlations. In these cases, the argument names and values for each system have a similar structure, but are separated by `//`. The order of arguments within a group so delimited is not significant, but the order in which the argument groups are encoded may be significant, affecting such things as sign conventions.

Any argument for which a default value is defined in the Basic Y-name Table below may be omitted if the default value is applicable. If the arguments are divided into groups by `//`, the defaults are supplied separately for each group; if the entire first group is defaulted but not the second, the following form to be used:

```
basic-y-name(//arg-name1=arg-value1),
            arg-name2=arg-value2,...)
```

The purpose of arguments to basic y-names is to supply information which, when combined with the basic name, completely specifies the dependent variable (at least, in those cases where the dependent variable is simple, i.e., it does not involve combinations of basic y-names with other basic y-names, with x-names, or with constants).

The Types of Arguments and Their Meanings

All argument types defined for x-names are also used in y-names. These arguments have the same meanings as already discussed in the Kinematic Variable Vocabulary and are also encoded in the same way. In particular, see the Kinematic Variable Vocabulary for a detailed discussion of the arguments P, X, T, Z, XYZ, RP, NAME, DEF, and Q.

In the following, we list the additional argument types which are defined for y-names, their meanings, and how their values are encoded.

- 1) L and J: These are angular momentum arguments. Only non-negative integer values are possible. L is used, for example, in Legendre polynomial expansion coefficients.
- 2) M: This argument represents the z-component of angular momentum; it is double the z-component if the particle has half odd-integer spin, and is thus always integer valued. M is usually used in pairs, as in density matrix elements; e.g., $RE(RHO)MM=J-1, P=4, XYZ=TR)$ for $\rho_{J-1}^{(M)}$. When the spin of a particle (system) is not determined precisely by its name, J is encoded also; e.g., $RHO(J)=0, MM=0, P=4, XYZ=TR)$ for the S-P wave interference density matrix element $\rho_{10}^{(0)} = \rho_{10}^{(0)}$ of $\pi^+\pi^-$ in the p meson region.

Differentiation Syntax

In the following, `<arg>` is any valid y-name, either basic or constructed following the rules given above. `<name>` is any valid x-name.

- 1) single differentiation: `D(<arg>)/D<name>`
- 2) multiple differentiation (in example, double):
 - a) `D1(<arg>)/D<name1>/D<name2>`, or equivalently
 - b) `D(D(<arg>)/D<name1>)/D<name2>`

For example, `D(SIC)/DT` for dS/dt .

Integration Syntax

In the following, `<arg>` is any valid y-name, either basic or constructed following the rules given above. `<name>` is any valid x-name.

- 1) single integration: `INT(<arg>)*D<name>`
- 2) multiple integration (in example, double):
 - a) `INT1(<arg>)*D<name1>*D<name2>`, or equivalently
 - b) `INT(INT(<arg>)*D<name1>)*D<name2>`

Note that the integration syntax is not always needed. For example,

$$\int_{-1}^1 \frac{dS}{dt} dt$$

may be encoded as

x-name = T IS CUV*F1,
 x-value = <v₁> TO <v₂>,
 y-name = SID IS RB.

Table of Basic Y-names

Basic Variable Name	Arguments with Default Values (? means no default defined)	Meaning
SIG		σ = cross section
N		number of events
SLOPE		from $\frac{dL}{d\Omega} \sim s$ (SLOPE)
LEG	(L=? , P=? , P=? , RP=CH)	$\left. \begin{matrix} R_L \\ R_L/A_0 \end{matrix} \right\} \frac{dL}{d\Omega} = s^2 2A_0 P_L$
LECH		
LECP	(L=? , P=? , P=? , RP=CH)	$\left. \begin{matrix} R_L \\ R_L/A_0 \end{matrix} \right\} P \frac{dL}{d\Omega} = s^2 2R_L P_L^+$
LECPB		
AMP	Default is spin non-flip forward amplitude in LAB	amplitude
ALPHA		RE(AMP)/IM(AMP)
PHASE		phase of AMP
POL	(P=? , Z=? , RP=CH)	polarization of particle P along Z
RHO	([JJ=?], MM=? , P=? , XYZ=?)	ρ_{mm}^{JJ} , density matrix element
POL.RHO	(ALPHA=? , P=? /MM=? , P=? , XYZ=?)	density matrix element with polarized photon beam
RHO.RHO	(MM=? , P=? , XYZ=? /MM=? , P=? , XYZ=?)	joint decay density matrix element
YLM	(LM=? , P=? , XYZ=?)	Y_L^M moment of particle P
STEN	(JN=? , P=? , XYZ=?)	statistical tensor

Examples of Polarization Observable Names

PS = PS

POL "polarization" = recoil or target asymmetry
POL.POL (NAME=7, SIZ=7)) double polarization measurement, e.g., NAME=A or B, spin-rotation parameters

PP = PP

POL "polarization" = recoil polarization asymmetry, or a logically equivalent polarization measurement

POL.POL (NAME=7) for a double polarization measurement, e.g., NAME=CSN, CSS, CSL, CLL, KSN, KSS, KLS, DSN or D, DES or S, SLS or A

POL.POL.POL (NAME=7) for a triple polarization measurement, e.g., NAME=KSSS, etc.

PS = PS

POL (NAME= "TARGET") target asymmetry

$$\left\{ \begin{array}{l} \text{PHOTON} \\ \text{RECOIL} \end{array} \right\}$$
 linearly polarized photon $\frac{\sigma_H - \sigma_V}{\sigma_H + \sigma_V}$

$$\left\{ \begin{array}{l} \text{PARITY} \end{array} \right\}$$
 recoil asymmetry
 (even if actually deduced from polarized beam and target measurement)

$$P_A = \frac{\sigma_H - \sigma_V}{\sigma_H + \sigma_V}$$

POL.POL (NAME= $\frac{C}{S}$) double polarization measurement

Examples of How Basic Y-names Are Used to Handle Special Cases

D(SIG(DOMEGA/DE(P=3))
 I=PHOTON*W)
 NU=W)

$$\left. \begin{array}{l} \frac{d^2\sigma}{d\Omega dE} \\ 2\sigma W_1 \\ \sigma W_2 \end{array} \right\}$$
 isotropic electron scattering

$$ap = a' + \dots$$

D(SIG(NAME= $\left\{ \begin{array}{l} R \\ L \\ P \\ 1 \end{array} \right\}$))/DT

$$\frac{d\sigma}{dt} = \frac{d\sigma}{dt} + \epsilon \frac{d^2\sigma}{d\Omega dE} + \cos\theta \frac{d\sigma}{dt} + \frac{A}{2} (1+\epsilon) \cos \frac{d\sigma}{dt}$$
 Electroproduction

POL.RHO(CALPHA=GA/MB+GO,XYZ=SH,NAME=E)
 τ_{ee}^{04} in ν^0
 electroproduction (polarized virtual ν)

SIG(PARITY= $\frac{N}{U}$))
 where natural and unnatural parity exchange contributions are separated

AMP(14)=aL,XYZ=ST)
 $\tau_{L,\nu}^N$ (forward direction, ν -channel transverse frame)

D(SIG(S1=V,S2=V))/DOMEGA
 $d(\nu)/d\Omega$ in pp + pp

ABS(AMP(NAME=KEIKEN))
 PHASE(NAME=KEIKEN)
 τ for $(t-t)$ in $K_{LP}^2 + K_{SP}^2$

LEGN(L=7).RE(RHO=GO,XYZ=SH)
 for Legendre coefficients of $(Reo_{10} \frac{d\sigma}{d\Omega})$

I-name Examples

Consider the reaction:



1 2 3 4

where the particle number is given below each particle. Then use

$D(SIG)/DT(P=3,P=1)$ IN MB/GEV**2

or $D(SIG)/DT$ IN MB/GEV**2 for $d\sigma/ds$ for $s_{p,p}$ in mb/GeV²

Consider the reaction:



1 2 3 4

Then use:

POL

for polarization P

$POL*Q(SIG)/DT$ IN MB/GEV**2

for $P \frac{dP}{ds}$

LEGL=0)

for A_1 in $\frac{dP}{dt} = h^2 A_1 P_1$ in c.m.

LEGL=0)

for $\frac{A_1}{A_0}$

Also, for the reaction



use

SIG IN MB

for $\sigma(pp)_{\text{total}}$ in mb

and for the reaction



use

SIG IN MB

for $\sigma(pp)_{\text{inelastic}}$ in mb

REFERENCE VOCABULARY

JOURNAL ABBREVIATIONS

AP	ARXIV FOR PHYSICS
APMT	ANNALS OF PHYSICS (NEW YORK)
APP	ACTA PHYSICA POLONICA
ARPPF	ACADEMIA REPUBLICAE POPULARE ROMANAE, STUD. CONCT. FIZICA
ASJP	AUSTRIAN JOURNAL OF PHYSICS
BAFIS	BULLETIN OF THE AMERICAN PHYSICAL SOCIETY
CRAS	COMPTES RENDUS SEMANAIERES DES SEANCES DE L'ACADEMIE DES SCIENCES
DANS	DOKLADY AKADEMII NAUK SSSR
FP	Fortschritte der Physik
RFA	RELATIVITA PHYSICA ACTA
ISAPF	IZVESTIYA AKADEMII NAUK SSSR, SERIYA FIZICHESKAYA
DET	INSTRUMENTS AND EXPERIMENTAL TECHNIQUES
JETP	SOVIET PHYSICS JETP
JETPL	JETP LETTERS
JP	JOURNAL DE PHYSIQUE
JPSJ	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN
NC	NOTES CERNES
NCL	LETTERS AL NORDO CERNES
NS	NOTES CERNES, SUPPLEMENTO
NP	NUCLEAR PHYSICS
NREL	NORDLUNDIA
PL	PHYSICS LETTERS
PM	PHILOSOPHICAL MAGAZINE
PN	PARTICLES AND NUCLES
PPSL	PROCEEDINGS OF THE PHYSICAL SOCIETY OF LONDON
PR	PHYSICAL REVIEW
PRL	PHYSICAL REVIEW LETTERS
PRSE	PROCEEDINGS OF THE ROYAL SOCIETY OF EDINBURGH
PRSL	PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON
PTP	PROGRESS OF THEORETICAL PHYSICS
RMP	REVIEWS OF MODERN PHYSICS
SJP	SOVIET JOURNAL OF NUCLEAR PHYSICS
SPD	SOVIET PHYSICS DOKLADY
ST	STADARATA FIZICA
ZF	ZEITSCHRIFT FÜR PHYSIK

PART IV
DOCUMENT SUMMARY LISTINGS

DATA LISTINGS

The Data Listings, on 65 microfiche which are included with this report, contain essentially all the information which is in our Reaction-Data database. The Listings are ordered alphabetically by the 'short code' of the document from which the data were extracted. The short code is a unique identifier assigned by us to each document; it is composed of the first author's last name, the year of issue, and a uniqueness letter or letters, if required (e.g., JONES 67). For a more complete discussion of short codes, see the text at the beginning of this report.

In steady-state, all data from a given document would be encoded in one record in the database and would appear in one unit on the fiche. Here, however, because we have used data from many sources, and for other historical reasons, data from the same paper may be broken up into several units; however, these units will be contiguous on the fiche.

For ease of reference, the first and last short codes contained on each fiche appear dictionary-style at the top of the fiche. An illustrative key to the Data Listings is given on the next page, showing the information available and the format used.

ILLUSTRATIVE KEY

DOCUMENT SHORT CODE	DEKREL 16	OF 800, 2ND (CIVIL) TO-200	REFERENCES AND PUBLICATION TYPES: SEE THE REFERENCE VOCABULARY FOR JOURNAL ABBREVIATIONS
MISCELLANEOUS OVERALL COMMENTS	CALCULATED PHOTON DENSITY, POLARIZED TARGET, DOUBLE SCATTERING		DEFINITIONS OF INDIVIDUAL COMMENTS REFERRED TO IN DATA TABLES BELOW
	COMMENTS "A" (SEE 1ST COLUMN BETWEEN RADIOACTIVE FIELD AND BEAM DIRECTIONS) "B" OPERATORION 2-PARAM + B-PARAMETER(CIVIL) + A-PARAMETER(CIVIL) "C" RESULTS OF DATA IN DEKREL ET AL., PL. 426, 336 (1970) "D" (SEE = 86 000) "E" (SEE = 87 000) "F" (2-PARAM + B-PARAMETER(CIVIL) + A-PARAMETER(CIVIL))		
SYSTEMATIC ERRORS, WHERE KNOWN	POL. HAS SYSTEMATIC ERROR = 5 PC		
REACTION: SEE THE REACTION; MOMENTUM VECTOR AND THE ARTICLE VOCABULARY FOR DEFINITIONS AND ABBREVIATIONS	COMMENT: POLARIZED TARGET ADJUSTED EQUALS NUCLEAR PHOTON POLARIZATION AT TIME REVERSAL		COMMENT APPLYING TO THE FOLLOWING TABLE OF DATA
	FUNCTION: $P \rightarrow P$ P IN 000 1.00 = 0.00		
VARYING KINEMATIC VARIABLES: SEE THE KINEMATIC VARIABLE VOCABULARY FOR DEFINITIONS	-E IN 00000	TIME IN 000	POL.
	0.180	35.3	0.18 = 0.007
	0.400	35.3	0.167 = 0.014
	0.540	35.3	0.185 = 0.016
	0.610	35.3	0.110 = 0.018
	0.750	41.3	0.099 = 0.023
	0.850	45.3	0.121 = 0.028
	0.940	48.3	0.1 = 0.030
	1.040	51.	0.080 = 0.036
	1.150	55.0	0.11 = 0.040
	1.270	58.7	0.108 = 0.040
	1.380	59.6	0.108 = 0.039
	1.500	61.0	0.117 = 0.041
	1.58	58.6	0.110 = 0.037
	1.740	63.5	0.082 = 0.033
	2.000	70.1	0.118 = 0.047
	2.440	80.6	0.060 = 0.047
	2.580	89.3	0.000 = 0.138
COMMENTS APPLYING TO THE FOLLOWING TABLE OF DATA - SEE SECTION AT TOP OF ENTRY FOR DEFINITION	COMMENTS: "A" COMMENTS: "B" COMMENTS: "C" REACTION: $P \rightarrow P$ P IN 000 1.00 = 0.00		INDICATES START OF NON DATA TABLE
NAMES AND VALUES OF KINEMATIC VARIABLES HELD CONSTANT FOR THE FOLLOWING DATA TABLE: SEE THE KINEMATIC VARIABLE VOCABULARY FOR DEFINITIONS	-E IN 00000	TIME IN 000	POL. POL. (NAME) (C) = APPROXIMATELY B-PARAM
	0.217	23.1	-0.12 = 0.01
	0.260	25.1	-0.17 = 0.2
	0.300	26.0	-0.08 = 0.17
	0.337	26.3	-0.31 = 0.18
	0.371	26.7	-0.1 = 0.18
	0.40	31.7	-0.34 = 0.12
	0.500	36.3	-0.61 = 0.12
	0.571	37.	-0.17 = 0.058