LBL-91 Revised
UC-34C
March 1983

LBL--91-Rev(2)

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CURRENT EXPERIMENTS IN ELEMENTARY-PARTICLE PHYSICS

C.G. Wohl, F.E. Armstrong, A. Rittenberg, T.G. Trippe, G.P. Yost
Particle Data Group, Lawrence Berkeley Laboratory, Berkeley, CA 94720 USA

L. Addis
Stanford Linear Accelerator Center, Stanford, CA 94305 USA

P. Joos
DESY, Notkestrasse 85, D-2000 Hamburg-52, Germany

Y. Oyanagi
University of Tsukuba, Sakura-mura, Niihari-gun, Ibaraki-ken 305, Japan

D.C. Dodder
Los Alamos National Laboratory, Los Alamos, NM 87545, USA

S.N. Gradtsin, Yu.G. Ryabov
Institute for High Energy Physics, Serpukhov, Protvino, Moscow Region, USSR

R. Frosch
SIN, Swiss Institute for Nuclear Research, CH-5234 Villigen, Switzerland

A. Olin
TRIUMF, 4004 Wesbrook Mall, Vancouver BC V6T 2A3, Canada

LAWRENCE BERKELEY LABORATORY
University of California

Prepared for the U.S. Department of Energy under contract DE-AC03-76SF00098

EXAMPLE FROM THE MICROFICHE (SEE INSIDE BACK COVER)

FOR ABBREVIATIONS USED FOR PARTICLES, INSTITUTIONS, ETC., SEE THE YELLOW PAGES.

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CESR-CUSB (1978); APPROVED FEB 1978; STARTED NOV 1979.

EXPERIMENT NAME OR NUMBER (DATE OF PROPOSAL) AND PROGRESS DATES

CUSB -- HIGH RESOLUTION CALORIMETER TO STUDY THE UPSILON SPECTROSCOPY AND B PHYSICS

TITLE

COLU -- P.FRANZINI(*SPOKESPERSON), K.HAN, S.W.HERB, D.SON, J.K.YOH, S.YOUSSEF
LSU -- R.IMLAY, G.LEVMAN, W.METCALF, V.SREEDHAR
MPIM -- H.DIETL, G.EIGEN, E.LORENZ, G.MAGERAS, F.PAUSS, H.VOGEL
STON -- G.FINOCCHIARO, J.E.HORSTKOTTE, C.KLOPFENSTEIN, J.LEE-FRANZINI, R.D.SCHAMBERGER, M.SIVERTZ, L.J.SPENCER, P.M.TUTS

INSTITUTIONS AND PARTICIPANTS. THE ASTERISK WITH "SPOKESPERSON" MEANS THE SUMMARY WAS CHECKED AND UPDATED BY HIM/HER

ACCELERATOR=CESR; DETECTOR=CUSB

ACCELERATOR AND DETECTOR

E+ E- --> HADRONS 9.4-11.6 GEV (ECM)
E+ E- --> E+ E- ''
E+ E- --> MU+ MU- ''

MAIN REACTIONS AND MOMENTA OR ENERGIES

UPSI(9460)
UPSI(10020)
UPSI(10350)
UPSI(10570)
CHI/B(10246)
BEAUTY
HIGGS
GLUEBALL
AXION

PARTICLES STUDIED

<EXPERIMENTAL COMMENT> FOR A DESCRIPTION OF THE APPARATUS, SEE THE LBL-91 SUPPLEMENT ON DETECTORS.

COMMENTS

<PUBLISHED PAPERS> PRL 44 (1980) 1111, PRL 45 (1980) 222, PRL 46 (1981) 1115, PRL 47 (1981) 771, PRL 48 (1982) 906, PR D26 (1982) 717, PR D26 (1982) 720, PL 114B (1982) 277, NP B206 (1982) 1, PRL 49 (1982) 1612, PRL 49 (1982) 1616, AND PL 118B (1982) 453.

JOURNAL PAPERS FROM EXPERIMENT

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University of Tsukuba, Sakura-mura, Niihari-gun, Ibaraki-ken 305, Japan

D.C. Dodder
Los Alamos National Laboratory, Los Alamos, NM 87545, USA

S.N. Gradtsin, Yu.G. Ryabov
Institute for High Energy Physics, Serpukhov, Protvino, Moscow Region, USSR

R. Frosch
SIN, Swiss Institute for Nuclear Research, CH-5234 Villigen, Switzerland

A. Olin
TRIUMF, 4004 Wesbrook Mall, Vancouver BC V6T 2A3, Canada

Abstract -- This report contains summaries of 479 approved experiments in elementary particle physics (experiments that finished taking data before 1 January 1979 are excluded). There are experiments from Brookhaven, CERN, CESR, DESY, Fermilab, Tokyo Institute of Nuclear Studies, KEK, LAMPF, Serpukhov, SIN, SLAC, and TRIUMF, and also experiments on proton decay. Properties of the beams at most of the laboratories are summarized.

**The Berkeley Particle Data Group is supported by the Director, Office of Energy Research, Office of High Energy and Nuclear Physics, Division of High Energy Physics of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098, and by the U.S. National Science Foundation under Agreement No. PHY-8022530.*

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INTRODUCTION

The microfiche at the back of this report contains summaries of 479 approved experiments in elementary particle physics. Experiments that finished taking data before 1 January 1979 are not included here but are available on a computer database (see p. 3). An example from the summaries is given on the inside front cover. Experiments at the following laboratories are included:

Brookhaven (BNL)	KEK
CERN	LAMPF
CESR	Serpukhov (SERP)
DESY	SIN
Fermilab (FNAL)	SLAC
Institute for Nuclear Studies, Tokyo (INS)	TRIUMF

There are also summaries of proton decay experiments (P-DECAY). A list of all the experiments with their titles begins on p. 4.

New features in this edition -- (1) CESR, LAMPF, SIN, TRIUMF, and P-DECAY experiments appear for the first time. (2) Preliminary versions of the summaries of experiments at Brookhaven, CERN, CESR, DESY, Fermilab, Tokyo Institute of Nuclear Studies, KEK, and SLAC were sent to spokespersons for checking and updating. If a reply was received (which occurred for 68% of these experiments), there is an asterisk by "spokesperson" in the summary. (3) Spokespersons were asked to list journal articles (if any) published from their experiments. The summaries on the microfiche include these lists. (4) There is a new supplement to LBL-91, entitled "Major Detectors in Elementary Particle Physics," in which 40 detectors are described in detail.

Guides to the microfiche -- There are four aids for finding particular experiments on the microfiche. One is the list of experiments and their titles already mentioned. The second is an index of initial-state particles and beam momenta, in order of increasing particle mass and momentum. The third is an index of spokespersons. Finally, the table of contents of "Major Detectors in Elementary Particle Physics" lists the experiments that use the detectors described therein.

Abbreviations -- To keep the summaries on the microfiche brief, abbreviations are used for kinematic variables, accelerators, journals, detectors, particles, and institutions. The abbreviations are usually obvious but are defined in the yellow pages at the center of the report.

Properties of particle beams -- Tables at the back of the report summarize the properties of beams for fixed-target experiments at Brookhaven, CERN, Fermilab, KEK, LAMPF, Serpukhov, SIN, SLAC, and TRIUMF.

Acknowledgments -- We thank P. Oddone (LBL) for encoding the proton decay experiments, G. Row (SLAC) for help with getting data from SLAC to LBL, D.R.O. Morrison (CERN) for permission to make extensive use of "Experiments at CERN in 1982," N. Baggett (BNL) for information on Brookhaven experiments, N. Gelfand (FNAL) for information on Fermilab experiments, C. Oram (TRIUMF) for a discussion about TRIUMF beams, and the approximately 300 spokespersons who

took the time to reply to our inquiries.

Comments and requests -- We invite comments pointing out omissions, obscurities, out-of-date information, and errors. Comments should be sent to:

Particle Data Group (50-308)
Attn: EXPERIMENTS
Lawrence Berkeley Laboratory
Berkeley, CA 94720
USA

Requests for copies from the Americas, Australasia, and the Far East should go to the above address, while those from other areas should go to:

CERN Scientific Information Service
CH-1211 Geneva 23
Switzerland

SEARCHING THE EXPERIMENTS DATABASE
(if you already know how to use the SLAC/SPIRES system)

This report is produced from a computerized database maintained under the SLAC/SPIRES database management system. The database, named EXPERIMENTS, is updated periodically, and contains everything in this report as well as earlier experiments. In particular, Argonne (ANL) and Rutherford (RHEL) experiments from earlier editions of LBL-91 are present.

Anyone who is familiar with SLAC/SPIRES and has an existing account can access this database online. If you have an account but are unfamiliar with SPIRES, an extensive wall poster, "Guide to VM Spires," is available from the SLAC library. If you do not have an account and cannot find anyone who does (at main laboratories, ask at the library), please contact SLAC directly.

To access the database:
SELECT EXPERIMENTS

To determine what indices are available for searching:
SHOW INDEX

To see a random selection of terms in an index:
BROWSE <index-name>
(e.g., BROWSE REACTION)

To search for experiments satisfying a certain criterion:
FIND <index-name> <value>

To list basic bibliographic information for these experiments:
TYPE

To switch to a format with more information (e.g., reactions, citations):
CLEAR FORMAT

To switch back to the basic format (with only bibliographic information):
SET FORMAT QUICKLIST

Some sample searches:

FIND AUTHOR JONES AND DATE-APPROVED 1975
(short form: FIN A JONES AND DA 1975)

FIND TITLE J/PSI
(short form: FIN T J/PSI)

FIND REACTION "E+ E- ---> E+ E-" AND DATE-COMPLETED AFTER 1978
(short form: FIN RE "E+ E- ---> E+ E-" AND DC AFTER 1978;
note the quotes required before and after the reaction)

FIND ACCELERATOR CERN-ISR
(short form: FIN ACC CERN-ISR)

FIND DETECTOR PLUTO
(short form: FIN DET PLUTO)

FINAL-STATE-PARTICLE INDEX (CONT'D)

LIST OF EXPERIMENTS AND TITLES

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CERN-PS-162	STUDY OF THE STRUCTURE OF EXOTIC LIGHT NUCLEI PRODUCED AT THE PS
CERN-PS-163-1	SEARCH FOR NARROW BARYONIUM STATES NEAR THE ANTI-P P THRESHOLD
CERN-PS-163-2	MEASUREMENT OF THE PBAR P EXCITATION FUNCTION
CERN-PS-164	THE INFLUENCE OF CHANNELLING ON ATOMIC AND NUCLEAR REACTION YIELDS
CERN-PS-165	MEASUREMENT OF THE K- P SCATTERING LENGTH AT THRESHOLD BY OBSERVATION OF KAONIC HYDROGEN X-RAYS FROM A CONDENSED TARGET
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CERN-PS-170	PRECISION MEASUREMENTS OF THE PROTON ELECTROMAGNETIC FORM FACTORS IN THE TIME-LIKE REGION AND VECTOR MESON SPECTROSCOPY
CERN-PS-171	A STUDY OF PBAR-P INTERACTIONS AT REST IN A H2 GAS TARGET AT LEAR
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LIST OF EXPERIMENTS AND TITLES

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CESR-CUSB	CUSB -- HIGH RESOLUTION CALORIMETER TO STUDY THE UPSILON SPECTROSCOPY AND B PHYSICS
DESY-ARGUS	A NEW DETECTOR FOR DORIS
DESY-CRYSTAL-BAL	A LARGE SOLID ANGLE NEUTRAL DETECTOR (THE CRYSTAL BALL)
DESY-LENA	PROPOSAL FOR MEASUREMENTS IN CONTINUATION OF DESY-147
DESY-PETRA-CELLO	PROPOSAL FOR A 4 PI MAGNETIC DETECTOR FOR PETRA -- CELLO
DESY-PETRA-JADE	JADE -- PROPOSAL FOR A COMPACT MAGNETIC DETECTOR AT PETRA
DESY-PETRA-MARKJ	A SIMPLE DETECTOR TO MEASURE E+ E- REACTIONS AT HIGH ENERGIES -- MARK J
DESY-PETRA-PLUTO	PROPOSAL FOR EXPERIMENTS AT PETRA WITH PLUTO
DESY-PETRA-PLU-2	A PROPOSAL TO STUDY GAMMA-GAMMA INTERACTIONS WITH THE DETECTOR PLUTO AT PETRA
DESY-PETRA-TASSO	PROPOSAL FOR A LARGE 4 PI MAGNETIC DETECTOR FOR PETRA -- TASSO
FNAL-053A	SEARCH FOR THE INTERMEDIATE BOSON, LEPTON PAIR PRODUCTION, AND A STUDY OF DEEPLY INELASTIC REACTIONS UTILIZING HIGH ENERGY NEUTRINO INTERACTIONS IN LIQUID NEON
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FNAL-253	NEUTRINO-ELECTRON SCATTERING AT NAL
FNAL-258	A PROPOSAL TO MEASURE PARTICLES PRODUCED AT HIGH TRANSVERSE MOMENTUM BY PIONS
FNAL-272	PROPOSAL TO MEASURE COHERENT DISSOCIATION OF PI-, K-, AND PBAR INTO TWO-BODY SYSTEMS AT NAL ENERGIES
FNAL-326	A PROPOSAL TO MEASURE MUON PAIRS PRODUCED AT HIGH TRANSVERSE MOMENTUM BY PIONS
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FNAL-361	PRECISION MEASUREMENT OF LAMBDA ----> E- NU P DECAY PARAMETERS
FNAL-380	STUDY OF PROPERTIES OF WEAK NEUTRAL CURRENTS IN THE INTERACTIONS OF A NARROW BAND NEUTRINO BEAM IN LIQUID NEON
FNAL-388	PROPOSAL TO STUDY NEUTRAL CURRENT NEUTRINO AND ANTI-NEUTRINO INTERACTIONS IN THE 15-FOOT BUBBLE CHAMBER USING THE EXTERNAL MUON IDENTIFIER AND A DICHROMATIC BEAM
FNAL-390	ANTINEUTRINO INTERACTIONS IN THE DEUTERIUM FILLED 15 FOOT BUBBLE CHAMBER
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FNAL-401	PHOTOPRODUCTION OF HIGH MASS TWO-BODY FINAL STATES
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FNAL-490	SEARCH FOR SHORT LIVED PARTICLES USING A HIGH RESOLUTION STREAMER CHAMBER
FNAL-497	HYPERON FLUXES AND POLARIZATIONS
FNAL-502	SEARCH FOR MONOPOLES ABOVE THE 15-FOOT BUBBLE CHAMBER
FNAL-508	STUDY OF MECHANISM FOR MULTIPLE PRODUCTION OF PARTICLES AT HIGH ENERGIES; EMULSION EXPOSURE TO ABOUT 750 GEV PROTONS
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FNAL-516	PROPOSAL TO STUDY PHOTOPRODUCTION OF FINAL STATES OF MASS ABOVE 2.5 GEV WITH A MAGNETIC SPECTROMETER IN THE TAGGED PHOTON LAB
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FNAL-531	A PROPOSAL TO STUDY WEAK DECAY LIFETIMES OF NEUTRINO PRODUCED PARTICLES IN A TAGGED EMULSION SPECTROMETER
FNAL-533	PROPOSAL TO MEASURE THE RATE OF FORMATION OF PI MU ATOMS IN KLOMG --> PI MU MU DECAY
FNAL-537	PROPOSAL TO STUDY ANTI-P N INTERACTIONS IN THE P-WEST HIGH INTENSITY LABORATORY
FNAL-545	PROPOSAL TO STUDY NEUTRINO INTERACTIONS IN DEUTERIUM IN THE 15-FOOT BUBBLE CHAMBER WITH PLATES
FNAL-549	A SEARCH FOR FRACTIONAL CHARGES USING ACCELERATOR AND LOW TEMPERATURE TECHNIQUES
FNAL-553	A PROPOSAL TO SEARCH FOR SHORT-LIVED PARTICLES PRODUCED BY ANTINEUTRINOS AND NEUTRINOS
FNAL-555	A PROPOSAL TO STUDY CROSS SECTIONS AND POLARIZATION IN NEUTRAL STRANGE PARTICLE PRODUCTION AT HIGH TRANSVERSE MOMENTUM
FNAL 557	PROPOSAL TO STUDY HADRON JETS WITH THE CALORIMETER TRIGGERED MULTIPARTICLE SPECTROMETER
FNAL-564	DIRECT DETECTION OF SHORT-LIVED PARTICLES FROM NEUTRINO INTERACTIONS IN NUCLEAR EMULSIONS INSIDE THE 15-FOOT BUBBLE CHAMBER
FNAL-565	A STUDY OF THE DETAILED CHARACTERISTICS OF HADRON-NUCLEUS COLLISIONS USING THE FERMILAB HYBRID SPECTROMETER
FNAL-567	SEARCH FOR CHARM PRODUCTION IN 200 GEV/C HADRON INTERACTIONS
FNAL-570	PROPOSAL FOR A STUDY OF PARTICLE PRODUCTION AND DYNAMICS FROM X = 0 TO X = 1 AND THE DEPENDENCE ON INCIDENT QUANTUM NUMBERS
FNAL-576	500 GEV PROTON INTERACTIONS IN NUCLEAR EMULSION
FNAL-577	PROPOSAL TO MEASURE PI P ELASTIC SCATTERING AT LARGE ANGLES
FNAL-580	A SEARCH FOR NARROW AND BROAD RESONANCES DECAYING INTO LAMBDA-ALAMBDA, LAMBDA-ALAMBDA-PI, K(SHORT)-K(SHORT) AND K(SHORT)-K(SHORT)-PI FROM PI- P INTERACTIONS AT 200-GEV/C USING THE FERMILAB MPS
FNAL-584	PROPOSAL TO SEARCH FOR THE DECAY OF NEW LONG-LIVED NEUTRAL PARTICLES WITH A MASS AND LIFETIME EXCEEDING THAT OF THE K(LONG)
FNAL-585	EXCLUSIVE K N CHARGE EXCHANGE
FNAL-591	BROAD SEARCH FOR NEW HADRONIC STATES VIA HIGH RESOLUTION CHARGE AND MASS DETERMINATION OF NUCLEAR FRAGMENTS FROM P-NUCLEUS COLLISIONS
FNAL-594	PROPOSAL FOR A NEW NEUTRINO DETECTOR AT FERMILAB
FNAL-595	A STUDY OF CHARM AND PROMPT SINGLE MUON PRODUCTION IN PROTON-NUCLEON AND PION-NUCLEON COLLISIONS
FNAL-597	PROPOSAL FOR A HIGH STATISTICS STUDY OF PBAR P ANNIHILATIONS AND A COMPARISON OF PBAR, P, PI-, PI+, AND K+ INTERACTIONS ON HYDROGEN, MAGNESIUM AND GOLD AT 100-GEV/C UTILIZING THE FERMILAB 30-INCH HYDROGEN BUBBLE CHAMBER AND DOWNSTREAM PARTICLE IDENTIFIER
FNAL-605	A STUDY OF LEPTONS AND HADRONS NEAR THE KINEMATIC LIMITS
FNAL-608	A SEARCH FOR ETA/C IN HADRONIC INTERACTIONS
FNAL-609	A STUDY OF THE STRUCTURE OF HIGH PT HADRONIC INTERACTIONS
FNAL-610	PION PRODUCTION OF HEAVY QUARK MESON STATES DECAYING INTO PSI/J(3097)
FNAL-612	A PROPOSAL TO MEASURE THE DIFFRACTIVE PHOTON DISSOCIATION ON HYDROGEN
FNAL-613	PROPOSAL FOR A PROMPT NEUTRINO EXPERIMENT AT FERMILAB
FNAL-615	A STUDY OF THE FONWARD PRODUCTION OF MASSIVE PARTICLES
FNAL-616	PROPOSAL TO MEASURE NEUTRINO STRUCTURE FUNCTIONS
FNAL-617	A STUDY OF DIRECT CP VIOLATION IN THE DECAY OF THE NEUTRAL KAON VIA A PRECISION MEASUREMENT OF ABS(ETA00/ETA+-)
FNAL-619	A MEASUREMENT OF THE SIGMA0-LAMBDA0 TRANSITION MAGNETIC MOMENT

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FNAL-620	PROPOSAL TO MEASURE THE MAGNETIC MOMENTS OF THE SIGMA+, XI-, SIGMA-, AND OMEGA- HYPERONS USING THE FERMILAB NEUTRAL HYPERON BEAM
FNAL-621	A MEASUREMENT OF THE CP VIOLATION PARAMETER ETA+-0
FNAL-622	PROPOSAL TO SEARCH FOR FRACTIONAL CHARGE PARTICLES FROM A MAGNETIZED BEAM DUMP
FNAL-623	HIGH-MASS STATES DECAYING INTO PHI PI AND PHI PHI PRODUCED CENTRALLY IN 300 GEV/C PI- P INTERACTIONS
FNAL-629	MEASUREMENT OF DIRECT PHOTON PRODUCTION IN HADRON-NUCLEUS COLLISIONS
FNAL-630	STUDY OF B PARTICLE AND CHARMED PARTICLE PRODUCTON AND DECAY USING A HIGH RESOLUTION STREAMER CHAMBER
FNAL-631	A MEASUREMENT OF NUCLEAR CALIBRATION CROSS SECTIONS FOR PROTONS BETWEEN 100 AND 1000 GEV
FNAL-632	AN EXPOSURE OF THE 15-FOOT BUBBLE CHAMBER WITH A NEON-HYDROGEN MIXTURE TO A WIDEBAND NEUTRINO BEAM FROM THE TEVATRON
FNAL-636	NEUTRINO INTERACTION STUDIES WITH A HEAVY LIQUID BUBBLE CHAMBER AT TEVATRON ENERGIES USING A BEAM DUMP TECHNIQUE TO PRODUCE THE NEUTRINO BEAM
FNAL-640	THE MULTIMUON SPECTROMETER AT THE TEVATRON
FNAL-646	SEARCH FOR THE NUTAU AND STUDY OF NUE AND ANUE INTERACTIONS
FNAL-649	PROPOSAL TO STUDY NUCLEON STRUCTURE FUNCTIONS AT HIGH Q SQUARED
FNAL-650	SEARCH FOR CHARM PRODUCTION IN HADRON INTERACTIONS
FNAL-652	NEUTRINO PHYSICS AT THE TEVATRON
FNAL-653	A PROPOSAL TO MEASURE CHARM AND B DECAYS VIA HADRONIC PRODUCTION IN A HYBRID EMULSION SPECTROMETER
FNAL-660	PROPOSAL TO STUDY THE EFFECT OF BENT CRYSTALS ON CHANNELING NEAR THE CRITICAL RADIUS OF BENDING
FNAL-663	COMPARISON OF POLARIZATIONS OF INCLUSIVELY PRODUCED LAMBDAS AND ANTILAMBDAS BY PROTONS, ANTIPROTONS, KAONS AND PIONS ON HYDROGEN
FNAL-665	MUON SCATTERING WITH HADRON DETECTION AT THE TEVATRON
FNAL-666	EMULSION EXPOSURE TO SIGMA MINUS BEAM AT FERMILAB
FNAL-672	A STUDY OF HADRONIC FINAL STATES PRODUCED IN ASSOCIATION WITH HIGH-PT JETS AND HIGH-MASS DIMUONS
FNAL-673	CHI MESON PRODUCTION BY HADRONS
FNAL-687	HIGH ENERGY PHOTOPRODUCTION OF STATES CONTAINING HEAVY QUARKS AND OTHER RARE PHENOMENA
FNAL-690	STUDY OF HADRONIC PRODUCTION AND SPECTROSCOPY OF STRANGE, CHARM, AND BOTTOM PARTICLES AT THE TEVATRON
FNAL-701	A SEARCH FOR NEUTRINO OSCILLATIONS WITH (DELTA M)**2 GREATER THAN 10 EV**2
FNAL-704	INTEGRATED PROPOSAL ON FIRST ROUND EXPERIMENTS WITH THE POLARIZED BEAM FACILITY
FNAL-705	A STUDY OF CHARMONIUM AND DIRECT PHOTON PRODUCTION BY 300 GEV/C ANTIPROTON, PROTON, PI+, AND PI- BEAMS
FNAL-706	A PROPOSAL TO MEASURE DIRECT PHOTON PRODUCTION AT TEVATRON ENERGIES
FNAL-710	MEASUREMENTS OF ELASTIC SCATTERING AND TOTAL CROSS SECTIONS AT THE FERMILAB PBAR-P COLLIDER
FNAL-713	PROPOSAL FOR A SEARCH FOR HIGHLY IONIZING PARTICLES FOR THE DO AREA AT FERMILAB
FNAL-715	PRECISION MEASUREMENT OF THE DECAY SIGMA- ---> N E- NU
FNAL-720	PROPOSAL TO SEARCH FOR +1/3 E STABLE PARTICLES USING CRYOGENIC SOURCES
FNAL--CDF	THE FERMILAB COLLIDER DETECTOR FACILITY (CDF)
INS-14-2	PION, P, DEUTERON PHOTOPRODUCTION OFF NUCLEI
INS-14-3	MEASUREMENT OF THE DIFFERENTIAL CROSS SECTION FOR THE REACTION GAMMA P ---> ETA P BY TAGGED PHOTON BEAM
INS-14-4	MEASUREMENT OF THE POLARIZED TARGET ASYMMETRY OF THE REACTION GAMMA N ---> PI- P IN THE SECOND RESONANCE REGION
INS-15-1	MEASUREMENT OF THE RECOIL PROTON POLARIZATION IN THE REACTION GAMMA P ---> PIO P
INS-15-2	MEASUREMENT OF GAMMA P ---> (PI+/- OR P) + ANYTHING BY TAGGED PHOTON BEAM
INS-15-3	MEASUREMENT OF THE BACKWARD DIFFERENTIAL CROSS SECTION FOR (GAMMA, P) REACTION OFF DEUTERIUM AND CARBON
INS-15-4	PHOTOPRODUCTION OF L- L+ OFF NUCLEI
INS-16-1	MEASUREMENT OF POLARIZED TARGET ASYMMETRY IN THE REACTION GAMMA DEUT ---> P N IN THE ENERGY RANGE BETWEEN 300 AND 650 MEV
INS-16-2	MEASUREMENT OF PI- PHOTOPRODUCTION RATE ON NUCLEUS TARGET
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INS-18-1	STUDY OF PHOTODISINTEGRATION OF INTERNUCLEAR QUASI-FREE DEUTERONS
INS-18-3	MEASUREMENT OF DIFFERENTIAL CROSS SECTION OF GAMMA DEUTERIUM ---> PIO DEUTERIUM REACTION
KEK-TR-001	STUDY OF ELECTRON-POSITRON ANNIHILATION PHENOMENA BY A DETECTOR WITH PARTICLE IDENTIFICATION
KEK-TR-002	TRISTAN E+ E- EXPERIMENTS BY VENUS COLLABORATION
KEK-010	SEARCH FOR RARE DECAY MODES K+ --> PI+ NU ANU, K+ --> PI+ 2GAMMA, AND K+ --> PI+ AXION
KEK-033	MEASUREMENT OF AP P TOTAL CROSS SECTION ALD FORWARD ELASTIC SCATTERING AT 396-737 MEV/C
KEK-034	MEASUREMENT OF THE POLARIZATION FOR THE REACTIONS K+ N --> K+ N, KO P AT 1.06, 1.28, 1.39, AND 1.49 GEV/C
KEK-045	PRODUCTION OF DIRECT ELECTRONS IN P NUCLEUS COLLISIONS AT 13 GEV/C
KEK-049	PRODUCTION OF POLARIZED LAMBDA PARTICLES AND THEIR BETA DECAYS
KEK-057	STUDIES OF P P INTERACTIONS IN THE MOMENTUM RANGE 0.9-2.0 GEV/C
KEK-062	STUDY OF AP P REACTIONS IN THE 3 TO 5 GEV/C REGION
KEK-064	STUDY OF 2PI, 3PI STATES IN PI- P INELASTIC FORWARD SCATTERING
KEK-066	MEASUREMENTS OF PIO, ETA, OMEGA, PHI, AND DETECTION OF X0(2800) AT HIGH PT
KEK-074	SEARCH FOR BARYONIUM STATES IN ANTIPROTON-NUCLEON INTERACTIONS
KEK-075	MEASUREMENTS OF POLARIZATION PARAMETERS IN ELASTIC PROTON-NEUTRON SCATTERING
KEK-079	CALIBRATION OF ELECTRON/PION IDENTIFICATION EFFICIENCY IN THE BUBBLE CHAMBER
KEK-080	STUDY OF DEUTERIUM-PROTON REACTIONS FROM 2.0 TO 4.0 GEV/C
KEK-081	ASYMMETRY IN THE ELASTIC SCATTERING OF K+ AND PI+ FROM DEUTERIUM NEAR 1.5 GEV/C
KEK-082	NUCLEAR REACTIONS WITH HIGH ENERGY PARTICLE BEAMS
KEK-083	MEASUREMENT OF PI DEUTERIUM ELASTIC SCATTERING
KEK-084	STUDY OF HADRON-NUCLEUS INTERACTIONS WITH EMULSION CHAMBERS
KEK-089	SEARCH FOR A HEAVY NEUTRINO EMITTED IN K+ ---> MU+ NU DECAY
KEK-092	MEASUREMENTS OF ASYMMETRY PARAMETER IN SIGMA+ ---> P GAMMA DECAY
KEK-099	STUDY OF MU+ POLARIZATION IN K-MU-2 DECAY
LAMPF-015	ELASTIC SCATTERING AND TOTAL CROSS SECTION MEASUREMENTS OF PROTON ON HYDROGEN, DEUTERIUM, AND HELIUM
LAMPF-031	A NEUTRINO EXPERIMENT TO TEST MUON CONSERVATION
LAMPF-032	PRECISION MEASUREMENT OF THE PROCESSES PI+- ---> PIO E+- NU
LAMPF-058-120	MEASUREMENT OF PI- P ---> GAMMA N, AND MEASUREMENT OF THE POLARIZATION ASYMMETRY AND THE DIFFERENTIAL CROSS SECTION OF PION NUCLEON CHARGE EXCHANGE FROM 160 TO 500 MEV
LAMPF-066	NEUTRON-PROTON POLARIZATION MEASUREMENTS WITH A POLARIZED TARGET; PHASE II, THE N-P SPIN CORRELATION OBSERVABLE, C/NN(THETA)
LAMPF-085	GAMMA-NEUTRINO CORRELATION AFTER NEGATIVE-MUON CAPTURE
LAMPF-131	A STUDY OF THE PI+ D ---> P P REACTION AT PION ENERGIES 10-60 MEV
LAMPF-190	A PRECISION MEASUREMENT OF THE PI-/PIO MASS DIFFERENCE
LAMPF-194	PROTON-PROTON D, R, AND A MEASUREMENTS
LAMPF-225	A STUDY OF NEUTRINO-ELECTRON ELASTIC SCATTERING
LAMPF-295	STUDY OF THE PION-DEUTERON SINGLE CHARGE-EXCHANGE REACTION D(PI-,PIO)2N
LAMPF-336	STUDY OF THE SPIN DEPENDENCE OF PROTON-PROTON PION PRODUCTION REACTIONS
LAMPF-337	MEASUREMENT OF THE CROSS SECTION FOR PI- P ---> PI- PI+ N AT 200 AND 229 MEV
LAMPF-358	ELASTIC SCATTERING OF PIONS FROM DEUTERIUM
LAMPF-360	THE MEASUREMENT OF THE POLARIZATION TRANSFER COEFFICIENTS D/T AND A'/T AT 800 MEV FOR THE REACTIONS D(P,N)2P, LI6(P,N)BE6, AND BE9(P,N)B9
LAMPF-363	MEASUREMENTS OF PI+ P AND PI- P ELASTIC SCATTERING
LAMPF-366	NONRESONANT PION PRODUCTION IN THE REACTION N P ---> PI- P P
LAMPF-385	MEASUREMENT OF THE POLARIZED P N ANALYZING POWER, A/Y(THETA), FROM 10-70 DEG THETA C.M.
LAMPF-388	LOW-ENERGY PION ELASTIC SCATTERING FROM THE PROTON AND DEUTERON AT 180 DEGREES

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LAMPF-392	A MEASUREMENT OF THE TRIPLE-SCATTERING PARAMETERS D, R, A, R', AND A' FOR PROTON-PROTON AND PROTON-NEUTRON SCATTERING AT 800 MEV
LAMPF-400-445	SEARCH FOR THE RARE DECAY MU+ ---> E+ E+ E-, AND SEARCH FOR THE LEPTON FLAVOR-VIOLATING DECAY MU+ ---> E+ GAMMA GAMMA
LAMPF-402	A MEASUREMENT OF THE POLARIZATION TRANSFER COEFFICIENTS D/T(0 DEG) AND A'/T(0 DEG) IN THE REACTION P P ---> N X AT 800 MEV
LAMPF-403	A MEASUREMENT OF THE TRIPLE-SCATTERING PARAMETER D/T FOR THE CHARGE-EXCHANGE REGION IN N P SCATTERING
LAMPF-421	SENSITIVE SEARCH FOR MU- ---> E- CONVERSION
LAMPF-44'	SEARCH FOR THE DECAY MUON ---> ELECTRON GAMMA
LAMPF-455	HIGH-PRECISION STUDY OF THE MU+ DECAY SPECTRUM
LAMPF-457	MEASUREMENT OF THE QUASI-FREE P N AND P P AND FREE P P ANALYZING POWERS, 500-800 MEV
LAMPF-462	ANALYZING POWER AND DIFFERENTIAL CROSS SECTIONS FOR THE REACTIONS P P ---> D PI+ AND P D ---> T PI+ AT ABOUT 600 MEV AND 400 MEV
LAMPF-47(	PI+ AND PI- ELASTIC SCATTERING FROM DEUTERIUM
LAMPF-492	POLARIMETER CALIBRATIONS AND SEARCH FOR ENERGY-DEPENDENT STRUCTURE IN P P ELASTIC SCATTERING VIA CROSS SECTION, ANALYZING POWER, AND WOLFENSTEIN PARAMETER MEASUREMENTS
LAMPF-498	MEASUREMENTS OF LONGITUDINAL CROSS SECTION DIFFERENCE FOR LONGITUDINAL POLARIZED BEAM AND TARGET; DELTA-SIGMA/L FOR (1) P P, (2) P DEUT, AND (3) N P.
LAMPF-504	MEASUREMENT OF THE TOTAL CROSS SECTION DIFFERENCE FOR PROTON-PROTON AND PROTON-NEUTRON SCATTERING IN PURE TRANSVERSE INITIAL SPIN STATES IN THE 400-800 MEV REGION
LAMPF-508	DIBARYON RESONANCES IN PION PRODUCTION
LAMPF-517	POLARIZED BEAM AND TARGET EXPERIMENTS IN THE P P SYSTEM. PHASE I. A/Y AND A/YY FOR THE D PI+ CHANNEL AND A/YY FOR THE ELASTIC CHANNEL FROM 500 TO 800 MEV
LAMPF-518	POLARIZED BEAM AND TARGET EXPERIMENTS IN THE P P SYSTEM; PHASE II. MEASUREMENTS OF A/ZZ AND A/XZ FOR THE D PI+ CHANNEL AND FOR THE ELASTIC CHANNEL FROM 500 TO 800 MEV
LAMPF-546	INVESTIGATION OF THE SPIN FORM FACTOR OF TRITIUM AND HELIUM-THREE
LAMPF-563	P P ELASTIC SCATTERING AT 800 AND 500 MEV
LAMPF-567	A STUDY OF THE PI+ D ---> P P REACTION AT PION ENERGIES 5-200 MEV
LAMPF-581	PI+- ELASTIC SCATTERING FROM DEUTERIUM AT 237 MEV
LAMPF-585	MEASUREMENT OF P P AND P D ELASTIC SCATTERING IN THE COULOMB INTERFERENCE REGION BETWEEN 500 AND 800 MEV
LAMPF-589	FREE-FORWARD N P ELASTIC-SCATTERING ANALYZING POWER MEASUREMENTS AT 800 MEV
LAMPF-590	MEASUREMENT OF D(THETA) IN P N AND N P SCATTERING AT 800, 650 MEV AND OTHER ENERGIES WITH ASSOCIATED P P MEASUREMENTS
LAMPF-605	A DIBARYON SEARCH AT EPICS
LAMPF-634	MEASUREMENT OF PARITY VIOLATION IN THE P-NUCLEON TOTAL CROSS SECTIONS AT 800 MEV
LAMPF-635	SPIN MEASUREMENTS IN P D ELASTIC SCATTERING
LAMPF-636	A MEASUREMENT OF THE WOLFENSTEIN POLARIZATION PARAMETERS D/LL, D/SL, K/LL, AND K/SL FOR P P ELASTIC SCATTERING
LAMPF-637	A MEASUREMENT OF THE VECTOR POLARIZATION OF THE DEUTERON IN THE REACTION P P ---> D PI+
LAMPF-638	A SEARCH FOR OSCILLATIONS USING MUON NEUTRINOS
LAMPF-645	A SEARCH FOR NEUTRINO OSCILLATIONS AT LAMPF
LAMPF-647	A NEUTRON OSCILLATION EXPERIMENT AT LAMPF
LAMPF-650	A SEARCH FOR NEUTRINO MIXING VIA NONEXPONENTIAL PI ---> MU NU DECAY
LAMPF-651	MEASUREMENT OF A LOWER LIMIT FOR THE SUBTRESHOLD PRODUCTION OF KAONS WITH 800-MEV PROTONS
LAMPF-664	THE MEASUREMENT OF THE POLARIZATION TRANSFER COEFFICIENTS A'/P AND D/T AT 500, 650, AND 800 MEV FOR THE REACTION D(P,N)2P
LAMPF-665	THE MEASUREMENT OF THE INITIAL STATE SPIN CORRELATION PARAMETERS C/LL AND C/SL IN N P ELASTIC SCATTERING AT 500, 650, AND 800 MEV
LAMPF-682	SEARCH FOR DIBARYON RESONANCES IN THE REACTION PI D ---> P PI N AT PLAB 200 TO 600 MEV/C
LAMPF-683	MEASUREMENT OF DELTA-SIGMA/L IN FREE NEUTRON-PROTON SCATTERING AT 500, 650, AND 800 MEV
LAMPF-685	SPIN CORRELATIONS IN THE REACTION P(D,D)P AT 500 MEV
LAMPF-689	A. NEUTRON COUNTER CALIBRATION USING TAGGED NEUTRONS FROM THE REACTION PI- D ---> N N, AND B. FEASIBILITY STUDY; MEASUREMENTS OF THE DIFFERENTIAL CROSS SECTION FOR PI- D ---> N N TO TEST CHARGE SYMMETRY AND ISOSPIN INVARIANCE
LAMPF-708	A MEASUREMENT OF THE DEPOLARIZATION, THE POLARIZATION, AND THE POLARIZATION ROTATION PARAMETERS AND THE ANALYZING POWER FOR THE REACTION P P ---> P PI+ N
LAMPF-726	SEARCH FOR THE C-NONINVARIANT DECAY PI0 ---> 3 GAMMA
LAMPF-758	TO CATCH A DEMON
P-DECAY-FREJUS	NUCLEON DECAY EXPERIMENT WITH A MODULAR FLASH CHAMBER DETECTOR
P-DECAY-HOMESTAK	THE HOMESTAKE GOLD MINE EXPERIMENT
P-DECAY-HPW	THE UTAH MINE EXPERIMENT
P-DECAY-IMB	THE IRVINE-MICHIGAN-BROOKHAVEN EXPERIMENT
P-DECAY-KAMIOKA	KEK-(UT) EXPERIMENT ON PROTON DECAY
P-DECAY-KGF	THE KOLAR GOLD FIELD EXPERIMENT
P-DECAY-NUSEX	THE MONT BLANC EXPERIMENT
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SERP-E-045	STUDY OF MUON CHARACTERISTICS IN NEUTRINO INTERACTIONS
SERP-E-091	STUDY OF CHARGE-EXCHANGE MESON SCATTERING PROCESSES ON NUCLEONS IN MOMENTUM RANGE < 20 GEV/C
SERP-E-092	MEASUREMENT OF LAMBDA MAGNETIC MOMENT
SERP-E-100	STUDY OF LARGE PT PARTICLE PRODUCTION IN P NUCLEON COLLISIONS AT 70 GEV
SERP-E-102	STUDY OF HYPERCHARGE EXCHANGE S ATTERING PROCESSES
SERP-E-104	SEARCH FOR CHARM
SERP-E-105	STUDY OF HADRON INTERACTIONS IN ENERGY RANGE 20-40 GEV
SERP-E-107	STUDY OF NEUTRINO AND ANTINEUTRINO INTERACTIONS WITH NUCLEI
SERP-E-111	SEARCH FOR NEW SHORT-LIVED PARTICLES IN NEUTRINO INTERACTIONS BY PHOTOEMULSION
SERP-E-112	POLARIZATION MEASUREMENT IN CHARGE-EXCHANGE REACTIONS AT 40 GEV/C
SERP-E-115	STUDY OF CHARGED PARTICLE RARE DECAYS
SERP-E-116	STUDY OF CHANGE-EXCHANGE REACTIONS AT SMALL MOMENTUM TRANSFER
SERP-E-119	RELATIVISTIC POSITHONIUM PHYSICS
SERP-E-120	EXPERIMENTS WITH HYPERON BEAMS
SERP-E-121	SEARCH FOR DECAY OF PARTICLES WITH MEAN LIFETIMES 10**(-11) TO 10**(-12) SEC
SERP-E-127	STUDY OF HADRON ATOMS AND ELEMENTARY PARTICLE PROPERTIES USING A CRYSTAL-DIFFRACTION SPECTROMETER AT THE SERPUKHOV PROTON SYNCHROTRON
SERP-E-130	LIQUID ARGON DETECTOR FOR HADRONS AND GAMMAS
SERP-E-132	INVESTIGATION OF POSSIBILITY OF BENDING AND COOLING OF BEAMS BY SINGLE CRYSTALS. DESIGN OF NEW TYPE DETECTORS FOR CHARGED PARTICLES
SERP-E-133	PROPOSAL TO EXTEND THE 32 GEV/C K+ P EXPERIMENT ON THE MIRABELLE BUBBLE CHAMBER UP TO 1 MILLION PICTURES
SERP-E-134	STUDY OF RARE ELECTROMAGNETIC DECAYS OF MESONS
SERP-E-135	CROSS SECTION MEASUREMENT OF INCLUSIVE PSIPRIME(3700) PRODUCTION ON NUCLEI AND J/PSI PRODUCTION ON P
SERP-E-136	NEUTRINO DETECTOR
SERP-E-138	STUDY OF MULTIPARTICLE AP P INTERACTIONS AT 32 GEV/C WITH STATISTICS OF 10 EVENTS/MICROBARN IN MIRABELLE
SERP-E-139	STUDY OF ANTIDEUTERON-PROTON AND ANTIDEUTERON-DEUTERON INTERACTIONS IN LUDMILLA
SERP-E-140	STUDY OF CHARGE-EXCHANGE REACTIONS AND SEARCH FOR NEW PARTICLES
SERP-E-142	INVESTIGATIONS OF ELECTROMAGNETIC DECAYS OF MESONS
SERP-E-143	STUDY OF THE PION STRUCTURE IN THE RADIATIVE SCATTERING REACTION ON NUCLEI
SERP-E-144	MEASUREMENTS OF THE SLOW ANTIPROTON YIELD IN 70 GEV PROTON INTERACTIONS

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SERP-E-146	SEARCH FOR NARROW BARYON RESONANCES IN HIGH ENERGY NEUTRON DIFFRACTIVE SCATTERING
SERP-E-147	STUDY OF REACTIONS WITH STRANGE PARTICLE PRODUCTION IN THE PI- MESON BEAM OF THE IHEP ACCELERATOR
SERP-E-148	STUDY OF EXCLUSIVE RESONANCE PRODUCTION IN RARE PROCESSES IN SIGMA-M
SERP-E-150	AN ADDITION TO EXPERIMENT E-138 WITH A PROGRAM OF P P AND P DEUTERON INVESTIGATIONS AT 32 GEV/C
SIN-R-71-07	P P ELASTIC SCATTERING BETWEEN 400 AND 600 MEV
SIN-R-71-08	PRECISION MEASUREMENT OF THE MUON MOMENTUM IN PION DECAY AT REST
SIN-R-71-12	DETERMINATION OF AN UPPER LIMIT OF THE NUMU MASS FROM PION DECAY IN FLIGHT
SIN-R-72-02	EXPERIMENTS WITH NEUTRON BEAMS
SIN-R-73-01-2	ENERGY AND ANGLE DEPENDENCE OF THE TENSOR POLARIZATION T20 IN PI D ELASTIC SCATTERING
SIN-R-74-05	ELECTRON POLARIZATION IN MUON DECAY
SIN-R-75-07-2	MEASUREMENT OF THE P PARAMETER IN PI- P ELASTIC AND CHARGE EXCHANGE SCATTERING
SIN-R-77-01	STUDY OF ANGULAR CORRELATIONS IN THE REACTIONS C12(MU-, NU)B12 (G.S.) AND O16(MU-, NU)N16 (G.S.)
SIN-R-78-02	MEASUREMENT OF CROSS SECTIONS FOR THE PRODUCTION OF CHARGED PIONS BY 590 MEV PROTONS
SIN-R-78-05-8	MEASUREMENT OF THE AXZ PARAMETER IN THE REACTION P P ---> PI+ D
SIN-R-78-06	MEASUREMENT OF THE REACTION P (POLARIZED) P (POLARIZED) ---> PI+ D AT 580 MEV
SIN-R-78-13-1	STUDY OF THE RADIATIVE DECAY OF THE PION
SIN-R-78-15-1	MEASUREMENT OF THE 2P-2S ENERGY DIFFERENCE IN MUONIC HYDROGEN
SIN-R-78-18	DETERMINATION OF THE VECTOR ANALYZING POWER IN PI D SCATTERING
SIN-R-79-05	SPECIAL REACTION CHANNELS OF PI+ AND PI- ABSORPTION IN LIGHT NUCLEI
SIN-R-79-07	THE STUDY OF THE REACTION PI+ D ---> P P WITH A VECTOR POLARIZED D TARGET
SIN-R-80-01	MEASUREMENT OF CROSS SECTIONS WITH A BEAM OF POLARIZED PROTONS AND A POLARIZED TARGET
SIN-R-80-11	SEARCH FOR ADMIXTURE OF HEAVY NEUTRINOS IN PI+ ---> MU+ NUMU DECAY
SIN-R-81-01	EXPERIMENTAL DETERMINATION OF THE STRONG INTERACTION SHIFT IN THE 2P-1S TRANSITION OF PIONIC HYDROGEN AND DEUTERIUM ATOMS
SIN-R-81-02	STUDY OF THE FORMATION OF MUONIC ATOMS IN LOW Z GASEOUS MATERIALS IN A CYCLOTRON TRAP
SIN-R-81-09	SEARCH FOR HEAVY NEUTRINOS IN PI ---> E NU DECAY
SIN-R-82-01	SEARCH FOR AN ADMIXTURE OF HEAVY NEUTRINOS IN THE DECAY OF PIONS AT REST
SIN-R-82-03-1	MEASUREMENT OF THE LIFETIME OF THE 2S STATE OF MUONIC HELIUM AT GAS PRESSURES BELOW 5 ATM
SIN-R-82-06	SPIN TRANSFER PARAMETERS IN THE PROTON-PROTON INELASTIC CHANNELS
SIN-Z-75-02	PARITY VIOLATION IN P P SCATTERING
SIN-Z-80-01	PARITY VIOLATION IN P ALPHA SCATTERING
SLAC-BC-063	PI+ P INTERACTIONS USING THE LEAD-GLASS WALL
SLAC-BC-065	SEARCH FOR EXOTIC MESONS PRODUCED IN ANTIPROTON-NUCLEON INTERACTIONS
SLAC-BC-070	SEARCH FOR MANIFESTLY EXOTIC STATES WITH STRANGENESS IN PHAB-DEUTERIUM INTERACTIONS AT 9 GEV/C
SLAC-BC-072	STUDY OF CHARM PHOTOPRODUCTION IN THE 5HF EXPOSED TO A POLARIZED MONO-ENERGETIC BACKSCATTERED LASER BEAM OF 20 GEV PHOTONS
SLAC-BC-073	MEASUREMENT OF LIFETIME AND OTHER PROPERTIES OF CHARMED PARTICLES
SLAC-E-130	PRECISE MEASUREMENTS OF ASYMMETRIES IN DEEP INELASTIC SCATTERING OF POLARIZED ELECTRONS BY POLARIZED PROTONS AND BY POLARIZED DEUTERONS
SLAC-E-133	MEASUREMENT OF THE ELASTIC ELECTRON-NEUTRON CROSS SECTION AT HIGH Q***
SLAC-E-135	COMPARISON OF K- P AND K+ P INTERACTIONS, AND A PROGRAMMATIC STUDY OF STRANGE QUARK SPECTROSCOPY
SLAC-E-136	ELASTIC ELECTRON-PROTON CROSS SECTIONS AT LARGE MOMENTUM TRANSFER
SLAC-E-137	SEARCH FOR LOW MASS, METASTABLE NEUTRAL PARTICLES AT SLAC
SLAC-PEP-002	SEARCH FOR HIGHLY IONIZING PARTICLES AT PEP
SLAC-PEP-004	A PEP FACILITY BASED ON THE TIME PROJECTION CHAMBER
SLAC-PEP-005	A GENERAL SURVEY OF PARTICLE PRODUCTION AT PEP
SLAC-PEP-006	A LEPTON TOTAL ENERGY DETECTOR AT PEP
SLAC-PEP-009	A PEP FORWARD DETECTOR FACILITY
SLAC-PEP-012	A HIGH RESOLUTION SPECTROMETER AT PEP
SLAC-PEP-014	A SEARCH FOR FREE QUARKS AT PEP
SLAC-PEP-020	DELCO AT PEP
SLAC-SP-024	A PROPOSAL FOR A LARGE SOLID ANGLE NEUTRAL DETECTOR FOR SPEAR 2 (THE CRYSTAL BALL)
SLAC-SP-029	STUDIES OF THE ECM = 3-8 GEV REGION USING THE MARK II DETECTOR AT SPEAR
SLAC-SP-030	A LARGE SOLID ANGLE NEUTRAL DETECTOR FOR SPEAR II (THE CRYSTAL BALL)
SLAC-SP-031	CHECKOUT OF MARK III DETECTOR AT SPEAR
SLAC-SP-032	STUDIES OF THE WEAK DECAYS OF D MESONS AT THE PSI(3770) RESONANCE
TRI-052	A NEW MEASUREMENT OF THE PI ---> E NU BRANCHING RATIO -- A TEST OF THE STANDARD MODEL
TRI-074	PROPOSAL TO MEASURE D, R, AND R' IN P P SCATTERING, 200 TO 525 MEV
TRI-104	SEARCH FOR MUON-ELECTRON CONVERSION AT TRIUMF
TRI-121	TEST OF CHARGE-SYMMETRY IN N P SCATTERING
TRI-137	LIFETIME OF THE POSITIVE MUON
TRI-168-197	2S MUONIUM PRODUCTION FROM THIN FOILS
TRI-171	TEST OF T-INVARIANCE IN P P SCATTERING
TRI-174	SPIN DEPENDENCE OF THE P P ---> P N PI+ REACTION
TRI-176-134	MEASUREMENT OF THE PARAMETER XI IN THE MUON DECAY
TRI-181	MEASUREMENT OF THE 1S STRONG INTERACTION SHIFT IN PIONIC HYDROGEN
TRI-185	PRECISE MEASUREMENT OF THE POLARIZATION PARAMETER XI; A SEARCH FOR THE EFFECTS OF A RIGHT-HANDED CHARGE BOSON IN MU+ DECAY
TRI-190	RADIATIVE POLARIZED NEUTRON CAPTURE ON PROTONS
TRI-192	MEASUREMENT OF THE PION PRODUCTION ASYMMETRIES FROM REACTION P P ---> DEUT PI+ WITH A POLARIZED PROTON BEAM AT ENERGIES 400-520 MEV
TRI-205	TENSOR ANALYZING POWER IN PION DEUTERIUM SCATTERING
TRI-217	LOW ENERGY, ELECTROMAGNETIC PION FORM FACTORS

BEAM-TARGET-MOMENTUM INDEX

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
GAMMA P		<1.3	INS-15-2
GAMMA P		<200.0	CERN-NA-014
GAMMA P	0.6	1.1	INS-15-1
GAMMA P	0.8	1.0	INS-14-3
GAMMA P	1.2		INS-17-1
GAMMA P	20.0		SLAC-BC-072
GAMMA P	20.0		SLAC-BC-073
GAMMA P	20.0	70.0	CERN-WA-057
GAMMA P	70.0	140.0	FNAL-516
GAMMA P	70.0	200.0	CERN-WA-069
GAMMA P	80.0	140.0	FNAL-612
GAMMA P	>100.0		CERN-NA-024
GAMMA N	0.5	0.9	INS-14-4
GAMMA NUCLEON	10.0	180.0	CERN-NA-001
GAMMA DEUT		<1.2	INS-18-3
GAMMA DEUT	0.3	0.6	INS-16-1
GAMMA DEUT	0.4	0.8	INS-15-3
GAMMA BE	40.0	200.0	FNAL-401
GAMMA NUCLEUS	0.	300.0	FNAL-458
GAMMA NUCLEUS	0.2	0.6	INS-14-2
GAMMA NUCLEUS	0.2	0.5	INS-17-2
GAMMA NUCLEUS	0.2	0.5	INS-18-1
GAMMA NUCLEUS	0.2	1.0	INS-16-2
GAMMA NUCLEUS	0.4	0.8	INS-15-3
GAMMA NUCLEUS	0.7	1.0	INS-15-4
GAMMA NUCLEUS	10.0	180.0	CERN-NA-001
GAMMA NUCLEUS	20.0	80.0	CERN-WA-058
GAMMA NUCLEUS	200.0	500.0	FNAL-687

MOMENTUM RANGES FOR NEUTRINO AND ANTINEUTRINO BEAMS ARE NOT DEFINED VERY SYSTEMATICALLY.

NU NE	10.0	200.0	FNAL-646
NUE E-	2.0E-02	5.3E-02	LAMPF-225
NUE E-	10.0	100.0	FNAL-253
NUE E-	10.0	200.0	FNAL-646
NUE NE	10.0	200.0	FNAL-646
NUE NUCLEUS	0.5	3.0	CERN-PS-180
NUE NUCLEUS	10.0	250.0	FNAL-636
NUE	0.	5.3E-02	LAMPF-645
ANUE E-	0.	230.0	FNAL-594
ANUE E-	10.0	100.0	FNAL-253
ANUE E-	10.0	200.0	FNAL-646
ANUE P	0.	5.3E-02	LAMPF-645
ANUE DEUT	4.0E-02		LAMPF-031
ANUE NE	10.0	200.0	FNAL-646
ANUE AL	2.0	30.0	SERP-E-045
NUMU E-	0.	12.0	BNL-734
NUMU E-	0.	150.0	CERN-WA-021
NUMU E-	0.	200.0	FNAL-053A
NUMU E-	0.	230.0	FNAL-594
NUMU E-	0.	260.0	CERN-WA-018
NUMU E-	2.0	30.0	SERP-E-045
NUMU E-	10.0	100.0	FNAL-253
NUMU P	0.	10.0	BNL-737
NUMU P	0.	12.0	BNL-734
NUMU P	0.	150.0	CERN-WA-021
NUMU P	0.	200.0	FNAL-053A
NUMU P	0.	260.0	CERN-WA-001
NUMU P	0.	260.0	CERN-WA-025
NUMU P	10.0	200.0	FNAL-545
NUMU P	28.0	43.0	FNAL-388
NUMU P	35.0	64.0	FNAL-388
NUMU P	50.0	150.0	FNAL-380
NUMU P	91.0	95.0	FNAL-388
NUMU P	131.0	143.0	FNAL-388
NUMU N	0.	0.2	BNL-704
NUMU N	0.	0.4	BNL-706
NUMU N	0.	10.0	BNL-737
NUMU N	0.	12.0	BNL-734
NUMU N	0.	230.0	FNAL-594
NUMU N	0.	260.0	CERN-WA-025
NUMU N	2.0	30.0	SERP-E-045
NUMU N	10.0	200.0	FNAL-545
NUMU NUCLEON	10.0	200.0	FNAL-545
NUMU NUCLEON	10.0	600.0	FNAL-649
NUMU DEUT	0.	10.0	BNL-737
NUMU DEUT	0.	260.0	CERN-WA-001
NUMU DEUT	0.	260.0	CERN-WA-025
NUMU C12	0.	0.2	BNL-704
NUMU NE	0.	200.0	FNAL-053A
NUMU NE	10.0	200.0	FNAL-646
NUMU NE	28.0	43.0	FNAL-388
NUMU NE	35.0	64.0	FNAL-388
NUMU NE	50.0	150.0	FNAL-380
NUMU NE	91.0	95.0	FNAL-388
NUMU NE	131.0	143.0	FNAL-388
NUMU AL	2.0	30.0	SERP-E-045
NUMU FE	0.	260.0	CERN-WA-001
NUMU FE	2.0	30.0	SERP-E-045
NUMU FE	30.0	230.0	FNAL-701
NUMU PB	0.	200.0	CERN-WA-044
NUMU NUCLEUS	0.	6.0	CERN-PS-167
NUMU NUCLEUS	0.	6.0	CERN-PS-168

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
NUMU NUCLEUS	0.	240.0	FNAL-594
NUMU NUCLEUS	0.	260.0	CERN-WA-018
NUMU NUCLEUS	0.5	1.5	CERN-PS-181
NUMU NUCLEUS	0.5	3.0	CERN-PS-180
NUMU NUCLEUS	5.0	20.0	SERP-E-111
NUMU NUCLEUS	10.0	20.0	SERP-E-107
NUMU NUCLEUS	10.0	100.0	CERN-WA-059
NUMU NUCLEUS	10.0	100.0	FNAL-531
NUMU NUCLEUS	10.0	100.0	FNAL-564
NUMU NUCLEUS	10.0	200.0	CERN-WA-047
NUMU NUCLEUS	10.0	200.0	FNAL-545
NUMU NUCLEUS	10.0	250.0	FNAL-636
NUMU NUCLEUS	10.0	400.0	FNAL-632
NUMU NUCLEUS	20.0	600.0	FNAL-652
NUMU NUCLEUS	25.0		CERN-WA-022
NUMU NUCLEUS	25.0	250.0	FNAL-616
NUMU NUCLEUS	>60.0		FNAL-553
NUMU NUCLEUS	65.0		CERN-WA-022
NUMU NUCLEUS	200.0		CERN-WA-022
NUMU	?		FNAL-356
NUMU	0.	5.3E-02	LAMPF-645
NUMU	0.	4.0	BNL-775
NUMU	0.	7.0	BNL-776
NUMU	6.0E-02	0.2	LAMPF-638
NUMU	0.5	3.0	CERN-PS-169
ANUMU E-	0.	12.0	BNL-734
ANUMU E-	0.	200.0	FNAL-180
ANUMU E-	0.	230.0	FNAL-594
ANUMU E-	0.	260.0	CERN-WA-018
ANUMU E-	10.0	100.0	FNAL-253
ANUMU P	0.	12.0	BNL-734
ANUMU P	0.	150.0	CERN-WA-021
ANUMU P	0.	200.0	FNAL-180
ANUMU P	0.	230.0	FNAL-594
ANUMU P	0.	260.0	CERN-WA-001
ANUMU P	0.	260.0	CERN-WA-025
ANUMU P	2.0	30.0	SERP-E-045
ANUMU P	28.0	43.0	FNAL-388
ANUMU P	35.0	64.0	FNAL-388
ANUMU P	50.0	150.0	FNAL-380
ANUMU P	91.0	95.0	FNAL-388
ANUMU P	131.0	143.0	FNAL-388
ANUMU N	0.	12.0	BNL-734
ANUMU N	0.	200.0	FNAL-180
ANUMU N	0.	260.0	CERN-WA-025
ANUMU NUCLEON	10.0	600.0	FNAL-649
ANUMU DEUT	0.	100.0	FNAL-390
ANUMU DEUT	0.	260.0	CERN-WA-001
ANUMU DEUT	0.	260.0	CERN-WA-025
ANUMU NE	10.0	200.0	FNAL-646
ANUMU NE	28.0	43.0	FNAL-388
ANUMU NE	35.0	64.0	FNAL-388
ANUMU NE	50.0	150.0	FNAL-380
ANUMU NE	91.0	95.0	FNAL-388
ANUMU NE	131.0	143.0	FNAL-388
ANUMU AL	2.0	30.0	SERP-E-045
ANUMU FE	0.	260.0	CERN-WA-001
ANUMU FE	0.	260.0	CERN-WA-018
ANUMU FE	2.0	30.0	SERP-E-045
ANUMU NUCLEUS	0.	6.0	CERN-PS-167
ANUMU NUCLEUS	0.	6.0	CERN-PS-168
ANUMU NUCLEUS	0.	240.0	FNAL-594
ANUMU NUCLEUS	0.	260.0	CERN-WA-018
ANUMU NUCLEUS	5.0	20.0	SERP-E-111
ANUMU NUCLEUS	10.0	20.0	SERP-E-107
ANUMU NUCLEUS	10.0	100.0	CERN-WA-059
ANUMU NUCLEUS	10.0	100.0	FNAL-531
ANUMU NUCLEUS	10.0	100.0	FNAL-564
ANUMU NUCLEUS	10.0	200.0	CERN-WA-047
ANUMU NUCLEUS	10.0	400.0	FNAL-632
ANUMU NUCLEUS	20.0	600.0	FNAL-652
ANUMU NUCLEUS	25.0	250.0	FNAL-616
ANUMU NUCLEUS	>60.0		FNAL-553
ANUMU	?		FNAL-356
ANUMU	0.	5.3E-02	LAMPF-645
ANUMU	6.0E-02	0.2	LAMPF-638
NUTAU NE	10.0	200.0	FNAL-646
NUTAU NUCLEUS	10.0	250.0	FNAL-636
ANUTAU NE	10.0	200.0	FNAL-646
E- P	?		SLAC-E-133
E- P	6.4		SLAC-E-130
E- P	18.0		SLAC-E-136
E- P	18.2		SLAC-E-130
E- P	21.0		SLAC-E-136
E- P	22.6		SLAC-E-130
E- P	28.5		SLAC-E-136
E- N	?		SLAC-E-133
E- DEUT	?		SLAC-E-133
E- DEUT	6.4		SLAC-E-130
E- DEUT	16.2		SLAC-E-130
E- DEUT	22.6		SLAC-E-130
E- NUCLEUS	20.0		SLAC-E-137
E-	1.0	10.0	CERN-PS-188
E-	5.0	20.0	CERN-WA-064

BEAM-TARGET-MOMENTUM INDEX

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
FOR E+E- COLLIDING BEAM EXPERIMENTS, WE GIVE THE CENTER-OF-MASS ENERGY. LAB MOMENTA RATHER THAN THE EQUIVALENT LAB MOMENTUM FOR SCATTERING ON A STATIONARY TARGET.			
E+ E-	?		SLAC-SP-031
E+ E-		<30.0	KEK-TR-001
E+ E-		<30.0	KEK-TR-002
E+ E-	0.2		CERN-NA-007
E+ E-	0.2		CERN-NA-007
E+ E-	0.2		CERN-NA-007
E+ E-	0.2		CERN-NA-007
E+ E-	1.5	4.0	SLAC-SP-029
E+ E-	1.5	4.2	SLAC-SP-024
E+ E-	1.5	4.2	SLAC-SP-030
E+ E-	1.5		SLAC-SP-032
E+ E-	1.8		SLAC-SP-032
E+ E-	1.9		SLAC-SP-032
E+ E-	3.7	5.8	DESY-LENA
E+ E-	4.0	18.0	SLAC-PEP-002
E+ E-	4.0	18.0	SLAC-PEP-004
E+ E-	4.0	18.0	SLAC-PEP-005
E+ E-	4.0	18.0	SLAC-PEP-006
E+ E-	4.0	18.0	SLAC-PEP-012
E+ E-	4.0	18.0	SLAC-PEP-020
E+ E-	4.5	5.8	DESY-ARGUS
E+ E-	4.5	8.0	CESR-CLEO
E+ E-	4.7	5.8	CESR-CUSB
E+ E-	4.7		DESY-CRYSTAL-BAL
E+ E-	5.0	20.0	DESY-PETRA-CELLO
E+ E-	5.0	20.0	DESY-PETRA-JADE
E+ E-	5.0	20.0	DESY-PETRA-MARKJ
E+ E-	5.0	20.0	DESY-PETRA-TASSO
E+ E-	5.0		DESY-CRYSTAL-BAL
E+ E-	6.0	15.0	SLAC-PEP-009
E+ E-	6.0	16.0	DESY-PETRA-PLUTO
E+ E-	14.5		SLAC-PEP-014
E+ E-	17.5		DESY-PETRA-PLU-2
E+	1.0	10.0	CERN-PS-188
E+	4.0	20.0	CERN-WA-064
MU- P	0.		SIN-R-78-15-1
MU- P	1.0.0	280.0	CERN-NA-002
MU- P	120.0	280.0	CERN-NA-009
MU- HE	0.		BNL-746
MU- HE	0.		SIN-R-82-03-1
MU- C12	6.5E-02		SIN-R-77-01
MU- FE	600.0		FNAL-640
MU- NUCLEUS	0.		LAMPF-086
MU- NUCLEUS	0.		LAMPF-421
MU- NUCLEUS	0.		TRI-104
MU- NUCLEUS	0.2		SIN-R-81-02
MU- NUCLEUS	100.0	250.0	CERN-NA-004
MU+ E-	?		IPI-168-197
MU+ AL	0.1		BNL-754
MU+ FE	600.0		FNAL-640
MU+	0.		LAMPF-031
MU+	0.		LAMPF-400-445
MU+	0.		LAMPF-444
MU+	0.		LAMPF-455
MU+	0.		TRI-137
MU+	0.		TRI-176-134
MU+	3.9E-02		TRI-185
MU+	0.1		SIN-R-74-05
MUON P	750.0		FNAL-665
MUON NUCLEUS	280.0		CERN-NA-028
MUON NUCLEUS	325.0		CERN-NA-028
MUON NUCLEUS	750.0		FNAL-665
PION E-	250.0		CERN-NA-007
PION E-	300.0		CERN-NA-007
PION NUCLEUS	350.0		CERN-NA-019
PI+ P	7.7E-02		LAMPF-388
PI+ P	8.7E-02		LAMPF-388
PI+ P	9.6E-02		LAMPF-388
PI+ P	0.1		LAMPF-388
PI+ P	0.1		LAMPF-388
PI+ P	0.1		LAMPF-388
PI+ P	0.1		LAMPF-388
PI+ P	0.2		LAMPF-058-120
PI+ P	0.3	0.5	CERN-SC-094
PI+ P	0.4	0.7	LAMPF-363
PI+ P	0.7		LAMPF-058-120
PI+ P	1.5	1.6	CERN-PS-160
PI+ P	2.5	14.0	CERN-PS-157
PI+ P	5.0	20.0	SERP-E-102
PI+ P	16.0		SLAC-BC-067
PI+ P	20.0		CERN-WA-056
PI+ P	50.0	200.0	CERN-WA-006
PI+ P	66.0		CERN-WA-076
PI+ P	100.0		FNAL-577
PI+ P	100.0		FNAL-597
PI+ P	100.0	300.0	CERN-NA-008
PI+ P	100.0	350.0	CERN-NA-024
PI+ P	147.0		FNAL-570
PI+ P	200.0		CERN-WA-070
PI+ P	200.0		FNAL-577
PI+ P	250.0		CERN-NA-022
PI+ P	300.0		CERN-WA-070
PI+ P	400.0		FNAL-609
PI+ P	450.0		CERN-WA-070
PI+ N	5.0	20.0	SERP-E-102
PI+ N	20.0		CERN-WA-056
PI+ DEUT	7.7E-02		LAMPF-388
PI+ DEUT	8.7E-02		LAMPF-388
PI+ DEUT	9.6E-02		LAMPF-388
PI+ DEUT	0.1		LAMPF-388
PI+ DEUT	0.1		LAMPF-131
PI+ DEUT	0.1		LAMPF-388
PI+ DEUT	0.1		LAMPF-388
PI+ DEUT	0.1		LAMPF-131
PI+ DEUT	0.1		LAMPF-131
PI+ DEUT	0.1		LAMPF-388
PI+ DEUT	0.1		LAMPF-567
PI+ DEUT	0.2		LAMPF-567
PI+ DEUT	0.2		LAMPF-567
PI+ DEUT	0.2	0.4	TRI-205
PI+ DEUT	0.2		LAMPF-567
PI+ DEUT	0.2	0.6	LAMPF-682
PI+ DEUT	0.2		LAMPF-567
PI+ DEUT	0.2	0.3	SIN-R-73-01-2
PI+ DEUT	0.2		LAMPF-567
PI+ DEUT	0.2		LAMPF-567
PI+ DEUT	0.2		SIN-R-78-1P
PI+ DEUT	0.2		LAMPF-458
PI+ DEUT	0.3	0.5	SIN-R-79-07
PI+ DEUT	0.3	0.4	LAMPF-605
PI+ DEUT	0.3		SIN-R-75-1P
PI+ DEUT	0.3		LAMPF-551
PI+ DEUT	0.4		LAMPF-551
PI+ DEUT	0.4		SIN-R-78-1P
PI+ DEUT	0.4		SIN-R-78-1P
PI+ DEUT	0.4		LAMPF-458
PI+ DEUT	0.4		SIN-R-75-1P
PI+ DEUT	0.4		LAMPF-458
PI+ DEUT	0.4		SIN-R-78-1P
PI+ DEUT	0.5	1.2	KEK-083
PI+ DEUT	0.5		LAMPF-358
PI+ DEUT	0.6		LAMPF-358
PI+ DEUT	0.7		KEK-083
PI+ DEUT	1.0	1.4	CERN-PS-159
PI+ DEUT	1.5		KEK-083
PI+ DEUT	5.0	20.0	SERP-E-091
PI+ DEUT	300.0		FNAL-705
PI+ HE3	0.	0.2	SIN-R-79-05
PI+ HE3	0.2		LAMPF-546
PI+ HE3	0.3		LAMPF-546
PI+ TRIT	0.2		LAMPF-546
PI+ TRIT	0.3		LAMPF-546
PI+ C	530.0		FNAL-706
PI+ NE	30.0		CERN-WA-051
PI+ NE	64.0		CERN-WA-061
PI+ MG	100.0		FNAL-597
PI+ AU	100.0		FNAL-597
PI+ NUCLEUS	0.8		BNL-692
PI+ NUCLEUS	1.0		BNL-768
PI+ NUCLEUS	20.0	150.0	CERN-WA-035
PI+ NUCLEUS	30.0		CERN-WA-072
PI+ NUCLEUS	75.0		FNAL-615
PI+ NUCLEUS	100.0	300.0	CERN-NA-010
PI+ NUCLEUS	150.0		CERN-NA-003
PI+ NUCLEUS	200.0		CERN-NA-003
PI+ NUCLEUS	200.0		FNAL-665
PI+ NUCLEUS	200.0		FNAL-629
PI+ NUCLEUS	250.0		CERN-NA-022
PI+ NUCLEUS	250.0		FNAL-615
PI+ NUCLEUS	280.0		CERN-NA-003
PI+ NUCLEUS	500.0		FNAL-672
PI+	0.		LAMPF-650
PI+	0.		TRI-052
PI+	9.0E-02		SIN-R-80-11
PI+	0.1		SIN-R-82-01
PI+	0.2		SIN-R-71-08
PI+	0.2		SIN-R-81-09
PI+	0.2		SIN-R-78-13-1
PI+	0.4		SIN-R-71-12
PI+	0.5		LAMPF-032
PI+	1.0	10.0	CERN-PS-188
PI+	2.0	20.0	CERN-PS-164
PIO	?		SERP-E-140
PIO	?		SERP-E-119
PIO	0.		LAMPF-726
PIO	0.		TRI-217
PI- P	?		SERP-E-140
PI- P	0.		TRI-181
PI- P	0.		TRI-217
PI- P		<8.0	KEK-064
PI- P	7.7E-02		LAMPF-388
PI- P	8.6E-02	0.1	LAMPF-190
PI- P	8.7E-02		LAMPF-388
PI- P	9.6E-02		LAMPF-388
PI- P	0.1		LAMPF-388
PI- P	0.1		LAMPF-388

BEAM-TARGET-MOMENTUM INDEX

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
PI- P	0.1		LAMPF-388
PI- P	0.1		SIN-R-81-01
PI- P	0.1		LAMPF-388
PI- P	0.2	0.4	SIN-R-75-07-2
PI- P	0.2		LAMPF-058-120
PI- P	0.3	0.5	CERN-SC-094
PI- P	0.3		LAMPF-337
PI- P	0.3		LAMPF-337
PI- P	0.4	0.7	LAMPF-363
PI- P	0.7		LAMPF-058-120
PI- P	1.1		SERP-E-092
PI- P	2.0	14.0	CERN-PS-157
PI- P	5.0	15.0	CERN-PS-153
PI- P	5.0	20.0	SERP-E-091
PI- P	8.0		BNL-771
PI- P	8.0	18.0	BNL-755
PI- P	12.0		CERN-WA-056
PI- P	13.0		BNL-726
PI- P	13.0		BNL-732
PI- P	13.0		SERP-E-115
PI- P	20.0		BNL-705
PI- P	20.0		CERN-WA-007
PI- P	20.0		SERP-E-148
PI- P	20.0	40.0	SERP-E-105
PI- P	21.0		BNL-769
PI- P	22.0		BNL-747
PI- P	25.0		SERP-E-116
PI- P	25.0		SERP-E-134
PI- P	30.0		SERP-E-148
PI- P	33.0		SERP-E-142
PI- P	40.0		CERN-WA-007
PI- P	40.0		SERP-E-112
PI- P	40.0		SERP-E-116
PI- P	40.0		SERP-E-147
PI- P	40.0		SERP-E-148
PI- P	40.0	55.0	SERP-E-135
PI- P	60.0		CERN-WA-007
PI- P	80.0		CERN-WA-007
PI- P	85.0		CERN-WA-067
PI- P	100.0		FNAL-577
PI- P	100.0		FNAL-607
PI- P	100.0	350.0	CERN-NA-024
PI- P	100.0	350.0	FNAL-258
PI- P	140.0		CERN-WA-011
PI- P	147.0		FNAL-570
PI- P	150.0		CERN-NA-005
PI- P	150.0	385.0	CERN-NA-008
PI- P	175.0		FNAL-663
PI- P	200.0		CERN-WA-070
PI- P	200.0		FNAL-577
PI- P	200.0		FNAL-580
PI- P	300.0		CERN-NA-005
PI- P	300.0		CERN-NA-012
PI- P	300.0		CERN-WA-070
PI- P	300.0		FNAL-623
PI- P	360.0		CERN-NA-013
PI- P	360.0		CERN-NA-016
PI- P	360.0		CERN-NA-027
PI- P	360.0		FNAL-597
PI- P	450.0		CERN-WA-070
PI- DEUT	7.7E-02		LAMPF-388
PI- DEUT	8.7E-02		LAMPF-388
PI- DEUT	9.6E-02	0.3	LAMPF-295
PI- DEUT	9.6E-02		LAMPF-388
PI- DEUT	0.1		LAMPF-388
PI- DEUT	0.1		LAMPF-388
PI- DEUT	0.1		LAMPF-388
PI- DEUT	0.1		SIN-R-81-01
PI- DEUT	0.1		LAMPF-388
PI- DEUT	0.2		LAMPF-478
PI- DEUT	0.3		LAMPF-689
PI- DEUT	0.3		LAMPF-581
PI- DEUT	0.4		LAMPF-581
PI- DEUT	0.4		LAMPF-368
PI- DEUT	0.4	1.2	KEK-083
PI- DEUT	0.4		LAMPF-359
PI- DEUT	0.5		LAMPF-358
PI- DEUT	1.0	1.4	CERN-PS-150
PI- DEUT	5.0	20.0	SERP-E-091
PI- DEUT	300.0		FNAL-701
PI- HE3	0.	0.2	SIN-R-79-05
PI- HE3	0.2		LAMPF-546
PI- HE3	0.3		LAMPF-546
PI- TRIT	0.2		LAMPF-546
PI- TRIT	0.3		LAMPF-546
PI- BE	100.0	200.0	CERN-NA-011
PI- BE	200.0		FNAL-567
PI- BE	225.0		FNAL-610
PI- BE	225.0		FNAL-326
PI- BE	275.0		FNAL-650
PI- BE	350.0		CERN-WA-077
PI- C	530.0		FNAL-706
PI- NE	30.0		CERN-WA-051
PI- NE	64.0		CERN-WA-051
PI- MG	100.0		FNAL-597

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
PI- MG	360.0		FNAL-597
PI- SI	200.0		CERN-NA-032
PI- CU	20.0		SERP-E-148
PI- CU	30.0		SERP-E-148
PI- CU	40.0		SERP-E-148
PI- CU	225.0		FNAL-326
PI- SN	225.0		FNAL-326
PI- WT	225.0		FNAL-326
PI- AU	100.0		FNAL-597
PI- AU	360.0		FNAL-597
PI- PB	100.0	200.0	CERN-NA-029
PI- NUCLEUS		<4.3	KEK-082
PI- NUCLEUS	0.8		BNL-692
PI- NUCLEUS	1.0		SERP-E-127
PI- NUCLEUS	20.0		SERP-E-148
PI- NUCLEUS	20.0	150.0	CERN-WA-035
PI- NUCLEUS	30.0		CERN-WA-072
PI- NUCLEUS	30.0		SERP-E-148
PI- NUCLEUS	40.0		SERP-E-143
PI- NUCLEUS	40.0		SERP-E-148
PI- NUCLEUS	40.0	55.0	SERP-E-135
PI- NUCLEUS	75.0		FNAL-615
PI- NUCLEUS	100.0	300.0	CERN-NA-010
PI- NUCLEUS	100.0	350.0	FNAL-258
PI- NUCLEUS	125.0		FNAL-537
PI- NUCLEUS	150.0		CERN-NA-003
PI- NUCLEUS	150.0		FNAL-272
PI- NUCLEUS	200.0		CERN-NA-003
PI- NUCLEUS	200.0		FNAL-490
PI- NUCLEUS	200.0		FNAL-515
PI- NUCLEUS	220.0		FNAL-565
PI- NUCLEUS	256.0		FNAL-615
PI- NUCLEUS	280.0		CERN-NA-003
PI- NUCLEUS	300.0		CERN-NA-017
PI- NUCLEUS	300.0		FNAL-272
PI- NUCLEUS	300.0		FNAL-595
PI- NUCLEUS	>300.0		CERN-NA-015
PI- NUCLEUS	340.0		CERN-WA-061
PI- NUCLEUS	340.0		CERN-WA-071
PI- NUCLEUS	360.0		CERN-WA-075
PI- NUCLEUS	360.0		FNAL-663
PI- NUCLEUS	600.0		FNAL-672
PI-	?		SERP-E-115
PI-	4.0E-02		SIN-R-75-15-1
PI-	4.0E-02		SIN-R-82-03-1
PI-	1.0	10.0	CERN-PS-188
PI-	2.0	20.0	CERN-PS-164
ETA	?		SERP-E-134
RHO0	?		SERP-E-148
OMEGA	?		SERP-E-140
OMEGA	?		SERP-E-134
ETAPRIME	?		SERP-E-134
PHI	?		SERP-E-140
A1(1270)-	?		SERP-E-148
D(1285)	?		SERP-E-142
FPRIME	?		SERP-E-142
A3(1680)-	?		SERP-E-148
UPSI(9460)	?		DESY-CRYSTAL-BAL
UPSI(10020)	?		DESY-CRYSTAL-BAL
K+ P	11.0		[illegible]
K+ P	12.0		CERN-WA-055
K+ P	32.1		SERP-E-133
K+ P	70.0		CERN-WA-027
K+ P	100.0		FNAL-577
K+ P	100.0		FNAL-597
K+ P	147.0		FNAL-570
K+ P	200.0		FNAL-577
K+ P	250.0		CERN-NA-022
K+ N	1.1		KEK-034
K+ N	1.3		KEK-034
K+ N	1.4		KEK-034
K+ N	1.5		KEK-034
K+ N	5.0	20.0	SERP-E-091
K+ N	5.0	20.0	SERP-E-102
K+ N	55.0		FNAL-555
K+ N	100.0		FNAL-555
K+ N	150.0		FNAL-555
K+ DEUT	1.5		KEK-081
K+ DEUT	1.7		KEK-081
K+ DEUT	5.0	20.0	SERP-E-091
K+ MG	100.0		FNAL-597
K+ AU	100.0		FNAL-597
K+ NUCLEUS	0.8		BNL-692
K+ NUCLEUS	20.0	150.0	CERN-WA-035
K+ NUCLEUS	70.0		CERN-WA-061
K+ NUCLEUS	200.0		FNAL-565
K+ NUCLEUS	253.0		CERN-NA-022
K+ NUCLEUS	500.0		FNAL-672
K+	0.		KEK-090
K+		<0.5	KEK-089
K+	0.5	0.7	KEK-010
K+	2.0	20.0	CERN-PS-164
K+	4.0		BNL-735
K+	6.0		BNL-777
K0	?		BNL-749

BEAM-TARGET-MOMENTUM INDEX

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
KS	50.0	200.0	FNAL-621
KS	450.0		CERN-NA-031
KL	0.	3.0	BNL-696
KL	70.0	200.0	FNAL-617
KL	50.0	150.0	FNAL-533
KL	50.0	200.0	FNAL-621
KL	450.0		CERN-NA-031
K- P	0.		CERN-PS-165
K- P	0.7		BNL-702
K- P	0.7		BNL-759
K- P	2.2		BNL-692
K- P	3.0		BNL-693
K- P	4.0		BNL-673
K- P	4.6		BNL-693
K- P	4.7		CERN-PS-147
K- P	5.0		BNL-673
K- P	5.0	20.0	SERP-E-091
K- P	6.0		BNL-771
K- P	6.0	16.0	CERN-WA-074
K- P	11.0		SLAC-E-136
K- P	12.0		CERN-WA-049
K- P	12.0		SERP-E-111
K- P	18.5		CERN-WA-010
K- P	20.0		CERN-WA-007
K- P	20.0		SERP-E-148
K- P	22.0		BNL-787
K- P	25.0		SERP-E-116
K- P	30.0		SERP-E-148
K- P	33.0		SERP-E-142
K- P	40.0		CERN-WA-007
K- P	40.0		SERP-E-112
K- P	40.0		SERP-E-116
K- P	40.0		SERP-E-148
K- P	40.0	55.0	SERP-E-134
K- P	60.0		CERN-WA-007
K- P	75.0		FNAL-556
K- P	80.0		CERN-WA-007
K- P	100.0		FNAL-577
K- P	100.0		FNAL-556
K- P	105.6		CERN-WA-028
K- P	150.0		FNAL-556
K- P	175.0		FNAL-663
K- P	200.0		FNAL-577
K- DEUT	1.0	1.4	CERN-PS-159
K- DEUT	5.0	20.0	SERP-E-091
K- HE	0.7		BNL-778
K- LI6	0.7		BNL-743
K- C	0.8		BNL-759
K- O	0.7		BNL-743
K- IR	6.0		BNL-751
K- NUCLEUS	0.5		CERN-PS-166
K- NUCLEUS	0.6		BNL-696
K- NUCLEUS	0.8		BNL-686
K- NUCLEUS	0.8		BNL-692
K- NUCLEUS	0.8		BNL-746
K- NUCLEUS	0.8		BNL-760
K- NUCLEUS	1.0		SERP-E-127
K- NUCLEUS	20.0	150.0	CERN-WA-035
K- NUCLEUS	40.0	55.0	SERP-E-135
K- NUCLEUS	70.0		CERN-WA-061
K- NUCLEUS	75.0		FNAL-272
K- NUCLEUS	200.0		FNAL-565
K- NUCLEUS	300.0		FNAL-672
K- NUCLEUS	500.0		FNAL-672
K-	?		SERP-E-115
K-	2.0	20.0	CERN-PS-164
KAON E-	250.0		CERN-NA-007
KAON E-	300.0		CERN-NA-007
MESON(UNSPEC)-	?		SERP-E-148

PROTON-PROTON COLLIDING BEAM EXPERIMENTS AT THE CERN-ISR ARE ORDERED BY THE EQUIVALENT LAB MOMENTUM FOR SCATTERING ON A STATIONARY TARGET RATHER THAN BY THE ACTUAL LAB(S) CENTER-OF-MASS) MOMENTUM.

P P	0.3		SIN-Z-75-02
P P	0.6	1.1	TRI-074
P P	0.7		THI-171
P P	0.8	1.2	SIN-R-71-07
P P	0.8	1.2	SIN-R-80-01
P P	0.8	1.5	LAMPF-498
P P	0.8	1.5	LAMPF-504
P P	0.9	2.0	KEK-057
P P	0.9		THI-174
P P	1.0		THI-192
P P	1.0	1.5	LAMPF-506
P P	1.0		TRI-174
P P	1.0		TRI-192
P P	1.0	1.2	SIN-R-75-06
P P	1.0	1.2	SIN-R-82-06
P P	1.0		TRI-192
P P	1.1		TRI-174
P P	1.1		TRI-192
P P	1.1		LAMPF-336
P P	1.1		LAMPF-392
P P	1.1		LAMPF-517
P P	1.1		LAMPF-563

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
P P	1.1		TRI-142
P P	1.1	1.5	LAMPF-618
P P	1.1		LAMPF-670
P P	1.1		TRI-174
P P	1.1		TRI-192
P P	1.2		SIN-R-75-06+8
P P	1.2		LAMPF-556
P P	1.2		LAMPF-577
P P	1.2		LAMPF-594
P P	1.2		LAMPF-638
P P	1.3		LAMPF-617
P P	1.3		LAMPF-686
P P	1.3		LAMPF-706
P P	1.3	1.6	LAMPF-436
P P	1.3		LAMPF-617
P P	1.4		LAMPF-617
P P	1.4		LAMPF-384
P P	1.4		LAMPF-402
P P	1.4		LAMPF-214
P P	1.4		LAMPF-594
P P	1.4		LAMPF-338
P P	1.4		LAMPF-392
P P	1.4		LAMPF-402
P P	1.4		LAMPF-457
P P	1.4		LAMPF-686
P P	1.4		LAMPF-696
P P	1.4		LAMPF-617
P P	1.4		LAMPF-663
P P	1.4		LAMPF-617
P P	1.4		LAMPF-706
P P	1.4		LAMPF-766
P P	1.4		BNL-777
P P	1.4		CERN-WA-104
P P	1.4		BNL-746
P P	1.4		BNL-717
P P	1.4		BNL-746
P P	1.4		CERN-WA-007
P P	1.4		BNL-746
P P	1.4		BNL-717
P P	1.4		BNL-746
P P	1.4		BNL-746
P P	1.4		CERN-PS-159
P P	1.4		CERN-WA-007
P P	1.4	200.0	CERN-WA-006
P P	1.4		CERN-WA-007
P P	1.4		CERN-PS-159
P P	1.4		CERN-WA-007
P P	1.4		FNAL-577
P P	1.4		FNAL-556
P P	1.4	300.0	CERN-WA-008
P P	1.4	300.0	CERN-WA-028
P P	1.4		FNAL-577
P P	1.4		FNAL-663
P P	1.4		CERN-WA-005
P P	1.4		CERN-WA-026
P P	1.4		CERN-WA-027
P P	1.4		FNAL-577
P P	1.4		FNAL-[illegible]
P P	1.4		CERN-[illegible]
P P	1.4		CERN-WA-022
P P	1.4	2047.5	CERN-R-208
P P	1.4	2047.5	CERN-R-216
P P	1.4	2047.5	CERN-R-416
P P	1.4		CERN-WA-026
P P	1.4	2047.5	CERN-R-211
P P	1.4		CERN-R-108
P P	1.4	2044.0	CERN-R-210
P P	1.4		CERN-WA-006
P P	1.4		CERN-WA-070
P P	1.4		CERN-WA-015
P P	1.4		CERN-WA-025
P P	1.4		CERN-WA-027
P P	>1.4		CERN-WA-023
P P	1.4		FNAL-557
P P	1.4		FNAL-609
P P	1.4		CERN-WA-070
P P	1.4		CERN-R-421
P P	1.4		CERN-R-608
P P	1.4	2047.5	CERN-R-110
P P	1.4	2047.5	CERN-R-501
P P	1.4	2047.5	CERN-R-808
P P	1.4	2114.1	CERN-R-806
P P	1.4		CERN-R-108
P P	1.4	2047.5	CERN-R-807
P P	1.4		FNAL-557
P P	1.4		CERN-R-421
P P	1.4		CERN-R-607
P P	1.4		CERN-R-108
P P	1.4		CERN-R-420
P P	1.4		CERN-R-106
P P	1.4		CERN-R-608
P P	1.4		CERN-R-419
P P	1.4		CERN-R-421
P P	1.4		CERN-R-422

BEAM-TARGET-MOMENTUM INDEX

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
P F	2047.5		CERN-R-608
P P	2067.4		CERN-R-607
P P	2074.0		CERN-R-108
P P	2114.1		CERN-R-420
P P	1.6E+05		CERN-R-703
P N		<70.0	SERP-E-119
P N	0.8	1.5	LAMPF-504
P N	1.1		LAMPF-392
P N	1.2		LAMPF-540
P N	1.3		KEK-075
P N	1.4		KEK-075
P N	1.5		LAMPF-385
P N	1.5		LAMPF-392
P N	1.5		LAMPF-457
P N	1.5		LAMPF-590
P N	1.6		KEK-075
P N	1.8		KEK-075
P N	32.0		SERP-E-150
P NUCLEON	1.5		LAMPF-634
P DEUT	1.0	1.5	LAMPF-498
P DEUT	1.1		LAMPF-635
P DEUT	1.1		LAMPF-664
P DEUT	1.3		LAMPF-585
P DEUT	1.3		LAMPF-635
P DEUT	1.3		LAMPF-664
P DEUT	1.5		LAMPF-385
P DEUT	1.5		LAMPF-015
P DEUT	1.5		LAMPF-360
P DEUT	1.5		LAMPF-462
P DEUT	1.5		LAMPF-635
P DEUT	1.5		LAMPF-664
P DEUT	20.0		BNL-717
P DEUT	24.0		BNL-717
P DEUT	32.0		SERP-E-150
P DEUT	70.0		SERP-E-100
P DEUT	300.0		FNAL-705
P HE	0.3		SIN-Z-80-01
P HE	1.5		LAMPF-715
P HE	72.1	525.2	CERN-R-210
P HE	118.7	513.5	CERN-R-110
P HE	480.8		CERN-R-418
P HE	1036.5		CERN-R-418
P BE	1.5		LAMPF-360
P BE	28.0		BNL-744
P BE	100.0	200.0	CERN-NA-011
P BE	300.0		FNAL-673
P BE	400.0		CERN-NA-020
P BE	400.0		FNAL-555
P C	400.0		FNAL-706
P C	530.0		FNAL-706
P C	800.0		FNAL-706
P C12	1.5		LAMPF-661
P MG	100.0		FNAL-597
P AR	200.0		CERN-NA-005
P CR	500.0		FNAL-524
P CU	400.0		CERN-NA-020
P CU	400.0		CERN-WA-054
P AG	500.0		FNAL-524
P XE	200.0		CERN-NA-005
P WT	500.0		FNAL-524
P AU	100.0		FNAL-597
P AU	400.0		CERN-NA-030
P U	20.0		CERN-PS-162
P NUCLEUS	?		KEK-084
P NUCLEUS		<13.0	KEK-082
P NUCLEUS	1.0		SERP-E-127
P NUCLEUS	1.0	28.0	BNL-778
P NUCLEUS	1.2		SIN-R-78-02
P NUCLEUS	4.0	13.0	KEK-045
P NUCLEUS	13.0		KEK-066
P NUCLEUS	26.0	150.0	CERN-WA-035
P NUCLEUS	26.0	400.0	FNAL-591
P NUCLEUS	70.0		SERP-E-120
P NUCLEUS	70.0		SERP-E-121
P NUCLEUS	70.0		SERP-E-144
P NUCLEUS	200.0		FNAL-565
P NUCLEUS	200.0		FNAL-629
P NUCLEUS	200.0	400.0	FNAL-466
P NUCLEUS	240.0		CERN-WA-046
P NUCLEUS	250.0		CERN-NA-022
P NUCLEUS	300.0		FNAL-595
P NUCLEUS	400.0		CERN-WA-038
P NUCLEUS	400.0		CERN-WA-052
P NUCLEUS	400.0		CERN-WA-065
P NUCLEUS	400.0		CERN-WA-066
P NUCLEUS	400.0		FNAL-497
P NUCLEUS	400.0		FNAL-549
P NUCLEUS	400.0		FNAL-557
P NUCLEUS	400.0		FNAL-565
P NUCLEUS	400.0		FNAL-605
P NUCLEUS	400.0		FNAL-608
P NUCLEUS	400.0		FNAL-613
P NUCLEUS	400.0		FNAL-631
P NUCLEUS	400.0	450.0	FNAL-622
P NUCLEUS	450.0		CERN-NA-031

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
P NUCLEUS	450.0		CERN-WA-068
P NUCLEUS	500.0		FNAL-576
P NUCLEUS	500.0		FNAL-672
P NUCLEUS	750.0		FNAL-508
P NUCLEUS	800.0		FNAL-557
P NUCLEUS	1000.0		FNAL-672
P WATER	30.0		BNL-739
P	1.0	10.0	CERN-PS-188
P	2.0	20.0	CERN-PS-164
N P	0.	400.0	CERN-NA-006
N P	0.6	1.2	SIN-R-72-02
N P	0.6	0.8	TRI-190
N P	1.0		LAMPF-498
N P	1.1		LAMPF-665
N P	1.1		LAMPF-683
N P	1.1		TRI-121
N P	1.1		LAMPF-492
N P	1.2		LAMPF-590
N P	1.2		LAMPF-066
N P	1.3		LAMPF-498
N P	1.3		LAMPF-665
N P	1.3		LAMPF-683
N P	1.5		LAMPF-366
N P	1.5		LAMPF-403
N P	1.5		LAMPF-492
N P	1.5		LAMPF-590
N P	1.5		LAMPF-498
N P	1.5		LAMPF-589
N P	1.5		LAMPF-665
N P	1.5		LAMPF-683
N P	19.0	28.0	BNL-766
N DEUT	0.6	1.2	SIN-R-72-02
N C	45.0		SERP-E-104
N SI	260.0		FNAL-400
N NUCLEUS	40.0	60.0	SERP-E-146
N NUCLEUS	300.0		FNAL-630
N	1.4E-04	4.3E-02	LAMPF-647
AN P	0.1	0.5	BNL-767
AN NUCLEUS	0.	1.0	CERN-PS-179
AP P	0.		CERN-PS-170
AP P	0.		CERN-PS-171
AP P	0.		CERN-PS-174
AP P	0.		CERN-PS-175
AP P	0.		CERN-PS-182
AP P	0.		CERN-PS-183
AP P	0.	0.3	CERN-PS-183
AP P	0.	0.5	CERN-PS-161
AP P	0.	0.6	BNL-708
AP P	0.	1.0	CERN-PS-179
AP P	0.	2.0	CERN-PS-170
AP P	0.2	0.6	CERN-PS-173
AP P	0.2	0.8	CERN-PS-172
AP P	0.3	2.0	CERN-PS-172
AP P	0.3	2.0	CERN-PS-178
AP P	0.3	0.6	BNL-762
AP P	0.4	0.7	KEK-033
AP P	0.4	0.6	BNL-742
AP P	0.4	0.9	BNL-730
AP P	0.4	0.9	BNL-738
AP P	0.4	1.0	CERN-PS-163-2
AP P	0.5	1.0	KEK-074
AP P	0.5		BNL-701
AP P	0.7		BNL-701
AP P	0.8	1.3	CERN-PS-163-1
AP P	0.9		BNL-701
AP P	1.5	2.0	CERN-PS-185
AP P	3.0		KEK-062
AP P	3.5		KEK-062
AP P	3.5	7.5	CERN-R-704
AP P	4.0		KEK-062
AP P	4.5		KEK-062
AP P	6.1		SLAC-BC-068
AP P	7.0		BNL-771
AP P	8.0	16.0	CERN-WA-074
AP P	8.9		SLAC-BC-068
AP P	12.0		CERN-WA-049
AP P	13.0		SERP-E-116
AP P	20.0		CERN-WA-007
AP P	20.0		SERP-E-148
AP P	25.0		SERP-E-116
AP P	30.0		SERP-E-148
AP P	32.0		SERP-E-138
AP P	32.0		SERP-E-150
AP P	40.0		CERN-WA-007
AP P	40.0		SERP-E-116
AP P	40.0		SERP-E-148
AP P	60.0		CERN-WA-007
AP P	74.0		CERN-WA-042
AP P	80.0		CERN-WA-007
AP P	100.0		CERN-NA-021
AP P	100.0		FNAL-577
AP P	100.0		FNAL-597
AP P	137.0		CERN-WA-042
AP P	147.0		FNAL-570
AP P	175.0		FNAL-663

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BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
AP P	200.0		CERN-NA-005
AP P	200.0		FNAL-537
AP P	200.0		FNAL-704
AP P	212.2		CERN-R-420
AP P	268.8		CERN-UA-06
AP P	293.3	2094.0	CERN-R-210
AP P	450.0		CERN-WA-070
AP P	478.7		CERN-R-421
AP P	478.7		CERN-R-608
AP P	476.7	2047.5	CERN-R-110
AP P	476.7	2047.5	CERN-R-211
AP P	478.7	2047.5	CERN-R-601
AP P	478.7	2047.5	CERN-R-608
AP P	511.2	2047.5	CERN-R-807
AP I	1030.7		CERN-R-421
AP P	1446.0		CERN-R-420
AP P	1495.9		CERN-R-608
AP P	2047.5		CERN-R-421
AP P	2047.5		CERN-R-608
AP P	2114.1		CERN-R-420
AP P	5328.0	1.6E+05	CERN-UA-04
AP P	47950.2	2.1E+06	FNAL-710
AP P	47950.2	2.1E+06	FNAL-711
AP P	1.3E+05	2.1E+06	FNAL--CDF
AP P	1.6E+05		CERN-R-708
AP P	1.6E+05		CERN-UA-01
AP P	1.6E+05		CERN-UA-02
AP P	1.6E+05		CERN-UA-03
AP P	1.6E+05		CERN-UA-05
AP N	9.0		SLAC-BC-070
AP N	32.0		SERP-E-150
AP DEUT	0.		CERN-PS-178
AP DEUT	0.		CERN-PS-179
AP DEUT	0.	0.5	CERN-PS-161
AP DEUT	0.	0.6	BNL-772
AP DEUT	0.	1.0	CERN-PS-179
AP DEUT	0.5		BNL-701
AP DEUT	0.7		BNL-701
AP DEUT	0.8	1.3	CERN-PS-163-1
AP DEUT	0.9		BNL-701
AP DEUT	6.1		SLAC-BC-068
AP DEUT	8.9		SLAC-BC-068
AP DEUT	32.0		SERP-E-150
AP DEUT	74.0		CERN-WA-042
AP DEUT	137.0		CERN-WA-042
AP DEUT	300.0		FNAL-705
AP HE3	0.	1.0	CERN-PS-179
AP HE	0.	1.0	CERN-PS-179
AP NE	0.	1.0	CERN-PS-179
AP MG	100.0		FNAL-597
AP AR	0.	1.0	CERN-PS-179
AP AR	200.0		CERN-NA-005
AP XE	200.0		CERN-NA-005
AP AU	100.0		FNAL-597
AP NUCLEUS	?		KEK-084
AP NUCLEUS	0.		CERN-PS-176
AP NUCLEUS	0.		CERN-PS-177
AP NUCLEUS	0.		CERN-PS-186
AP NUCLEUS	0.	0.5	CERN-PS-161
AP NUCLEUS	0.	0.6	CERN-PS-187
AP NUCLEUS	0.3	0.8	CERN-PS-184
AP NUCLEUS	20.0	150.0	CERN-WA-035
AP NUCLEUS	70.0		CERN-WA-061
AP NUCLEUS	125.0		FNAL-537
AP NUCLEUS	150.0		FNAL-272
AP NUCLEUS	300.0		FNAL-272
AP NUCLEUS	500.0		FNAL-672

BEAM AND TARGET	LAB MOMENTUM OR MOMENTUM RANGE (GEV/C)		EXPERIMENT
AP	3.0	20.0	CERN-PS-164
LAMBDA P	30.0	60.0	SERP-E-120
LAMBDA DEUT	30.0	60.0	SERP-E-120
LAMBDA NUCLEUS	80.0	300.0	FNAL-619
LAMBDA	?		KEK-049
LAMBDA	60.0	200.0	FNAL-361
SIGMA+ P	30.0	60.0	SERP-E-120
SIGMA+ DEUT	30.0	60.0	SERP-E-120
SIGMA+	?		KEK-032
SIGMA+	120.0	400.0	FNAL-620
SIGMA- P	30.0	60.0	SERP-E-120
SIGMA- P	74.0		CERN-WA-042
SIGMA- P	137.0		CERN-WA-042
SIGMA- DEUT	30.0	60.0	SERP-E-120
SIGMA- DEUT	74.0		CERN-WA-042
SIGMA- DEUT	137.0		CERN-WA-042
SIGMA- BE	135.0		CERN-WA-062
SIGMA- NUCLEUS	0.		BNL-721
SIGMA- NUCLEUS	1.0		SERP-E-127
SIGMA- NUCLEUS	30.0	300.0	FNAL-666
SIGMA-	100.0		CERN-WA-046
SIGMA-	125.0	240.0	FNAL-620
SIGMA-	240.0		FNAL-715
XI0 P	30.0	60.0	SERP-E-120
XI0 DEUT	30.0	60.0	SERP-E-120
XI- P	30.0	60.0	SERP-E-120
XI- P	74.0		CERN-WA-042
XI- P	137.0		CERN-WA-042
XI- DEUT	30.0	60.0	SERP-E-120
XI- DEUT	74.0		CERN-WA-042
XI- DEUT	137.0		CERN-WA-042
XI-	120.0	260.0	FNAL-620
OMEGA- P	30.0	60.0	SERP-E-120
OMEGA- DEUT	30.0	60.0	SERP-E-120
OMEGA-	100.0		CERN-WA-046
OMEGA-	120.0	260.0	FNAL-620
OMEGA-	150.0		CERN-WA-046
DEUT P	1.5		LAMPF-685
DEUT P	2.0	4.0	KEK-080
DEUT HE3	2.0	8.0	SIN-R-73-01-2
DEUT	5.0	37.0	CERN-WA-033
ADEUT P	12.0	13.0	SERP-E-139
ADEUT DEUT	12.0	13.0	SERP-E-139
ADEUT	5.0	37.0	CERN-WA-033
HE3	5.0	37.0	CERN-WA-033
AHE3	5.0	37.0	CERN-WA-033
TRIT	5.0	37.0	CERN-WA-033
ATRIT	5.0	37.0	CERN-WA-033
HE HE	70.2	623.5	CERN-R-210
HE HE	116.9	511.8	CERN-R-110
HE HE	116.9	511.8	CERN-R-807
HE HE	125.1	511.8	CERN-R-807
HE HE	2091.7		CERN-R-418
HE	5.0	37.0	CERN-WA-033
AHE	5.0	37.0	CERN-WA-033
BOR12	6.5E-02		SIN-R-77-01
LONGLIVED	5.0	37.0	CERN-WA-033
HADRON P	200.0	2000.0	FNAL-690
HADRON P	360.0		CERN-NA-026
HADRON NUCLEUS	?		CERN-NA-018
CHARGED+ P	80.0		CERN-WA-063
CHARGED+	10.0	40.0	SERP-E-132
CHARGED+	50.0	200.0	FNAL-660
CHARGED- P	40.0		CERN-WA-063
CHARGED-	10.0	40.0	SERP-E-132
CHARGED-	50.0	200.0	FNAL-660
NEUTRAL	?		FNAL-584

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ADAIR, R.K.	YALE	BNL-749
ALBROW, M.G.	RHEL	CERN-R-807
ANDERSON, H.L.	LANL	LAMPF-455
ANTIPOV, Y.M.	SERP	SERP-E-143
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ARNOLD, R.G.	AMER	SLAC-E-136
ASTBURY, A.	RHEL	CERN-UA-01
ASTON, D.	SLAC	SLAC-E-135
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AVILEZ, C.	MEXU	BNL-766
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BAILLON, P.	CERN	CERN-PS-153
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BALTAY, C.	COLU	FNAL-646
BALTAY, C.	COLU	FNAL-784
BALTAY, C.	COLU	FNAL-953A
BARKOV, L.M.	NOVO	SERP-E-092
BARLOUTAUD, R.	SACL	P-DECAY-FREJUS
BARLOUTAUD, R.	SACL	CERN-PS-168
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BARNETT, B.	JHU	BNL-776
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BLOOM, E.	SLAC	DESY-CRYSTAL-BAL
BLOOM, E.D.	SLAC	SLAC-SP-024
BLOOM, E.D.	SLAC	SLAC-SP-030
BODEK, A.	ROCH	FNAL-595
BOLOTOV, V.N.	MINR	SERP-E-115
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BONNER, B.E.	LANL	LAMPF-635
BOUDRIE, R.L.	LANL	LAMPF-681
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FIORINI, E.	MILA	CERN-PS-167
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HAYANO, R.	TOKY	KEK-099
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HESS, R.	GEVA	SIN-R-82-06
HESS, R.	GEVA	SIN-R-78-06
HESS, R.	GEVA	SIN-R-71-07
HIGHLAND, V.L.	TEMP	LAMPF-726
HIRSCHMANN, H.	VILL	SIN-R-75-07-2
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HITLIN, D.	SLAC	SLAC-SP-029
HITLIN, D.	CIT	SLAC-SP-031
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JOURNALS

Following are abbreviations for journals listed in the summaries:

AJP	American Journal of Physics
ANNP	Annals of Physics
BAPS	Bulletin of the American Physical Society
HPA	Helvetica Physica Acta
IEEE TNS	Institute of Electrical and Electronics Engineers Transactions in Nuclear Science
JASA	Journal of the Acoustical Society of America
JETPL	JETP Letters (translation of ZETFP)
JPSJ	Journal of the Physical Society of Japan
LNC	Lettere al Nuovo Cimento
NIM	Nuclear Instruments and Methods
NP	Nuclear Physics
PL	Physics Letters
PR	Physical Review
PREP	Physics Reports (Physics Letters C)
PRL	Physical Review Letters
PS	Physica Scripta
SJNP	Soviet Journal of Nuclear Physics (translation of YF)
YF	Yadernaya Fizika (translated as SJNP)
ZETFP	Pis'ma v Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (translated as JETPL)
ZPHY	Zeitschrift für Physik

KINEMATIC VARIABLES

The following abbreviations are used with reactions to indicate the momenta or energies at which they are studied:

PLAB	beam momentum in the lab frame
TLAB	beam kinetic energy in the lab frame
ECM	total energy in the c.m. frame
Q2	absolute value of the 4-momentum transfer

ACCELERATORS

BNL	Brookhaven (AGS) Proton Synchrotron (31 GeV/c Plab)
CERN	CERN (PS) Proton Synchrotron (28 GeV/c Plab)
CERN-ISR	CERN Proton-Proton ISR (62 GeV Ecm)
CERN-PBAR/P	CERN Proton-Antiproton Collider (540 GeV Ecm)
CERN-SC	CERN Synchro-Cyclotron (600 MeV Tlab)
CERN-SPS	CERN Super Proton Synchrotron (450 GeV/c Plab)
CESR	Cornell Positron-Electron Storage Ring (16 GeV Ecm)
DESY	Deutsches Electron Synchrotron (7.5 GeV/c Plab)
DESY-DORIS	DESY Positron-Electron Ring (11.6 GeV Ecm)
DESY-PETRA	DESY Positron-Electron Colliding Beams (40 GeV Ecm)
FNAL	FNAL Proton Synchrotron (500 GeV/c Plab)
FNAL-TEV	FNAL Tevatron (2000 GeV Ecm)
KEK	KEK Proton Synchrotron (13 GeV/c Plab)
KEK-TRISTAN	KEK Positron-Electron Ring (60 GeV Ecm)
LAMPF	Los Alamos Meson/Proton Factory (1460 MeV/c Plab)
SERP	IHEP Serpukhov Proton Synchrotron (76 GeV/c Plab)
SIN	Schweizerisches Inst. fur Nuklearforschung (590 MeV Tlab)
SLAC	Stanford Electron Linear Accelerator (33 GeV/c Plab)
SLAC-PEP	SLAC Positron-Electron Project (36 GeV Ecm)
SLAC-SPEAR	SLAC Positron-Electron Ring (8.4 GeV Ecm)
TOKY	INS Tokyo Electron Synchrotron (1.3 GeV/c Plab)
TRIUMF	Canadian Triangle Universities Meson Facility (520 MeV Tlab)

DETECTORS

For bubble chambers we use a construction such as:

DBC-2M

or

HBC-15FT-HYB

or

HLBC-BEBC-TST.

The first element, one of

HBC
DBC
HEBC
HLBC,

tells whether the chamber fill is hydrogen, deuterium, helium, or heavy liquid. The second element gives the size or name of the chamber. Where appropriate, a third element, one of

HYB
RAP
TST,

indicates that the chamber is part of a hybrid system, or that it is rapid cycling, or that it contains a track-sensitive target.

For non-bubble-chamber detectors, general abbreviations are:

CALO	calorimeter
CNTR	counters (no chambers)
COMB	combinations of different types of detectors, no particular one dominant
DAS	double arm spectrometer
EMUL	emulsion
OSPK	optical spark chambers
OTHER	rare non-electronic detectors (e.g., moon, ocean floor)
PHOTON	photon spectrometer
PLASTIC	lexan or other such material in which tracks are frozen (except emulsion)
SAS	single arm spectrometer
SPEC	general spectrometer
STRC	streamer chamber
WIRE	wire chambers (proportional wire chambers, drift chambers, etc.; includes all non-optical spark chambers by convention)
WAS	wide angle spectrometer

DETECTORS (CONT'D)

Acronyms for specific detectors:

AFS	CERN-ISR axial field spectrometer
ARGUS	DESY-DORIS detector system
CCS	FNAL Chicago cyclotron spectrometer
CDF	FNAL-TEV Collider detector
CDHS	CERN-Dortmund-Heidelberg-Saclay neutrino detector (WA1)
CELLO	DESY-PETRA spectrometer system
CHARM	CERN-Hamburg-Amsterdam-Rome-Moscow-neutrino detector
CLEO	CESR spectrometer
CRYBOX	LAMPF crystal array detector
CRYS-BALL	SLAC-SPEAR and DESY-DORIS large solid angle neutral detector
CUSB	CESR high resolution calorimeter
DELCO	SLAC-SPEAR and PEP detector system
EHS	European hybrid spectrometer at CERN-SPS
EMS	CERN-SPS European muon collaboration detector
EPICS	LAMPF energetic pion spectrometer and detection system
FMPS	Fermilab multiparticle spectrometer
GAMS	gamma spectrometer at Serpukhov
HPW	Harvard-Penn-Wisconsin neutrino detector at BNL
HRS	SLAC-PEP high resolution spectrometer
JADE	DESY-PETRA spectrometer system
JANUS	LAMPF proton polarimeter
LAB-E	FNAL target-calorimeter muon-spectrometer detector for neutrino physics
LAHRS	LAMPF high resolution proton spectrometer
LASS	SLAC large aperture solenoid spectrometer
LENA	DESY-DORIS detector system
MAC	SLAC-PEP magnetic calorimeter
MARK-II	SLAC-SPEAR and PEP spectrometer system
MARK-III	SLAC-SPEAR spectrometer system (not related to MARK-II)
MARK-J	DESY-PETRA spectrometer system
MPS	BNL multiparticle spectrometer
MPS-II	upgraded BNL MPS
OMEGA	CERN OMEGA spectrometer
OMEGAPRIME	upgraded CERN OMEGA spectrometer
PLUTO	DESY-DORIS and PETRA superconducting solenoid spectrometer
RMS	Rutherford multiparticle spectrometer, now at CERN
SFM	CERN-ISR split field magnet
SIGMA	CERN-IHEP magnetic spectrometer at Serpukhov
SSF	SLAC spectrometer facility -- 1.6, 8, and/or 20 GeV
SUPERBENKEI	KEK superconducting magnetic spectrometer
TASSO	DESY-PETRA spectrometer system
TELAS	KEK target-embodied large-aperture spectrometer
TOPAZ	KEK-TRISTAN solenoidal spectrometer with TPC
TPC	SLAC-PEP time projection chamber
UA1	CERN-PBAR/P detector
UA2	CERN-PBAR/P detector
VENUS	KEK-TRISTAN spectrometer
2-GAMMA	SLAC-PEP detector to study 2-gamma process

PARTICLE VOCABULARY

ABARYON	unspecified antibaryon
ACHARM	particle with negative charm
ADEUT	antideuteron
AD0	charmed meson (C = -1)
AG	silver nucleus
AHE	anti-helium-4 nucleus
AHE3	anti-helium-3 nucleus
AK0	S = -1 K0
AK*(UNSPEC)0	unspecified S = -1 neutral K*
AL	aluminum nucleus
ALAMBDA	antilambda
AN	antineutron
ANNIHIL	pure annihilation final state in nucleon-antinucleon scattering
ANU	antineutrino
ANUCLEON	antinucleon
ANUCLEUS	general antinucleus
ANUE	electron antineutrino
ANUMU	muon antineutrino
ANUTAU	tau antineutrino
ANYTHING	
AP	antiproton
AQUARK(1/3)	antiquark
AQUARK(2/3)	antiquark
AR	argon nucleus
ASIGMA0 ASIGMA+ ASIGMA-	antisigma
ASTRANGE	unspecified S = +1 particle
ATRIT	anti-tritium nucleus
AU	gold nucleus
AXION	hypothesized light Higgs scalar boson
AXI0 AXI+	anti-xi
A+	baryon with quark content usc
A0	baryon with quark content dsc
A1(1270)0 A1(1270)+ A1(1270)-	
A2(1320)0 A2(1320)+ A2(1320)-	
A3(1680)0 A3(1680)+ A3(1680)-	
BARYON	unspecified baryon
BARYONIUM	meson coupling mainly to baryon-antibaryon
BE	beryllium nucleus
BEAUTY	particle with nonzero beauty (or bottom)
BOR12	boron-12
B(1235)0 B(1235)+ B(1235)-	
B(5200)	meson with beauty
C	carbon nucleus
CA	calcium nucleus
CD	cadmium nucleus
CENTAURO	final state with 50 or more charged particles, no pi0's
CHARGED	charged particle
CHARGED+	positive charged particle

PARTICLE VOCABULARY (CONT'D)

CHARGED-	negative charged particle
CHARM	unspecified particle with charm
CHARMED-BARYON	unspecified baryon with charm
CHI(UNSPEC)0	unspecified radiative decay product of psi(3685)
CHI(3510)	radiative decay product of psi(3685)
CHI(3550)	radiative decay product of psi(3685)
CHI/B(10246)	radiative decay product of high mass upsilons
CHI/B(UNSPEC)	unspecified radiative decay product of high mass upsilons
CR	chromium nucleus
CU	copper nucleus
C12	carbon-12 nucleus
C*(4.44)	4.44 keV excited state of carbon
DD	diffraction dissociation; followed by particles so produced, e.g. DD -> P P[0 ->
DELTA(980)0 DELTA(980)+ DELTA(980)-	
DEL-	DEL(1232P33)-
DEL0	DEL(1232P33)0
DEL+	DEL(1232P33)+
DEL++	DEL(1232P33)++
DEL(UNSPEC)0	unspecified I=3/2 baryon
DEL(UNSPEC)++	unspecified I=3/2 baryon
DEMON	exotic-3 diquark deuteron-like state
DEUT	deuteron
DIBARYON	unspecified S=0 dibaryon resonance
DIHYPERON	unspecified S=-2 dihyperon resonance
D0	charmed meson
D+	charmed meson
D-	charmed meson
D*(2010)-	charmed meson
D*(2010)+	charmed meson
D*(2010)0	charmed meson
D(UNSPEC)	unspecified charmed meson
D(1285)	
EPSILON	pi-pi S-wave
ETA	
ETAPRIME	recurrence of the eta
ETAPRIME C	recurrence of the eta c
ETA/C	lowest mass JP=0- charmonium state
EXOTIC-MESON	cannot be formed of quark-antiquark
EXOTIC-NUCLEON	cannot be formed of three quarks
E+	positron
E+-	electron or positron
E-	electron
E(1420)	
F	F(1270) meson resonance
FE	iron nucleus
F PRIME	
FRAG	nuclear fragment

F1(1540)0 F1(1540)+ F1(1540)-	
F+	charmed strange meson
F-	charmed strange meson
GAMMA	any photon
GLUEBALL	
GLUON	
HADRON	unspecified hadron
HADRON+	positive hadron
HADRON-	negative hadron
HE	helium-4 nucleus
HE3	helium 3
HIGGS	Higgs boson
HYPERNUC	hypernucleus
HVY-LEPTON	general heavy lepton
HVY-NEUTRINO	heavy neutrino
HVY-NUE	
HVY-NUMU	
H(2040)	I=0, JP=4+ meson resonance
INELASTIC	same as ANYTHING, except elastic excluded
IR	iridium nucleus
JET	jet detected as a whole
J/PSI	
KAON	unspecified kaon or antikaon
KL	K long
KS	K short
K0 K+	
K-	
K*(UNSPEC)	unspecified K*
K*(UNSPEC)0	unspecified K*
K*(892)0 K*(892)+ K*(892)	
K*(1430)0 K*(1430)+ K*(1430)-	
LAMBDA	
LAMBDA/C+	charmed baryon
LAM(UNSPEC)	I=0, S=-1 baryon
LAM(1330B)	unverified bump at 1330 MeV
LAM(1520D03)	
LEPTON	unspecified lepton
LI6 LI7	lithium nuclei
LONGLIVED	stable under strong or electromagnetic decay; mass and other quantum numbers not specified
MESON	unspecified meson
MESON(UNSPEC)0	unspecified neutral meson
MESON(UNSPEC)+	unspecified charge+1 meson
MESON(UNSPEC)-	unspecified charge-1 meson
MG	magnesium nucleus
MONOPOLE	magnetic monopole
MUON	mu+ or mu
MU+ MU-	
N	neutron

NE	neon nucleus
NEUTRAL	neutral particle
NIT12	nitrogen-12 nucleus
NNBAR(2020)0	nucleon-antinucleon state
NNBAR(2200)0	nucleon-antinucleon state
NU	neutrino
NUCLEON	nucleon
NUCLEUS	general nucleus
NUE	electron neutrino
NUMU	muon neutrino
NUTAU	tau neutrino
N*5/2(UNSPEC)	unspecified I=5/2, S=0 baryon
N*(UNSPEC)0	unspecified S=0 baryon
N*(UNSPEC)+	unspecified S=0 baryon
N(UNSPEC)0	unspecified I=1/2, S=0 baryon
N(UNSPEC)+	unspecified I=1/2, S=0 baryon
N(1520D13)0 N(1520D13)+	
N(1675D15)0 N(1675D15)+	
O	oxygen nucleus
OMEGA	meson resonance
OMEGA-	S=-3 baryon
OMEGA*(UNSPEC)	unspecified S=-3 baryon resonance
OMEGA*(UNSPEC)-	unspecified S=-3 baryon resonance
P	proton
PB	lead nucleus
PHI	
PHIPRIME	recurrence of the phi
PION	pion of unspecified charge
PI0	
PI+	
PI+-	charged pion
PI-	
PRONG	a charged prong
PSI(UNSPEC)	unspecified JP=1- charmonium state
PSI(3685)	
PSI(3770)	
QUARK	unspecified quark
QUARK(1/3)	quark
QUARK(2/3)	quark
RHO0 RHO+ RHO-	
RHOPRIME(1350)0 RHOPRIME(1350)+ RHOPRIME(1350)-	
SI	silicon nucleus
SIGMA0 SIGMA+ SIGMA-	
SIGMA/C++	I=1 charmed baryon
SIG(UNSPEC)0	unspecified I=1, S=-1 particle
SIG(UNSPEC)+	unspecified I=1, S=-1 particle
SIG(UNSPEC)-	unspecified I=1, S=-1 particle
SIG(1385P13)0 SIG(1385P13)+ SIG(1385P13)-	
SN	tin nucleus

PARTICLE VOCABULARY (CONT'D)

STRANGE	unspecified strange particle
STRANGEONIUM	meson whose quark content is dominantly s-sbar, such as the phi
S+	intermediate scalar boson
S-	intermediate scalar boson
S*(975)	pi-pi or K-Kbar S-wave
S(1935)0 S(1935)+ S(1935)-	
TACHYON	
TAU	heavy .epton
TAU+	positive heavy lepton
TAU-	negative heavy lepton
TOPONIUM	top-antitop state
TRIT	tritium nucleus
TRUTH	particle with nonzero truth (or top)
U	uranium nucleus
UNSPEC	particle of unspecified type
UPSI(UNSPEC)	unspecified upsilon particle
UPSI(9460)	
UPSI(10020)	
UPSI(10350)	
UPSI(10570)	
VEE	unspecified neutral strange particle decay
VMESON	unspecified vector meson
VMESON0	unspecified vector meson
WATER	
WT	tungsten nucleus -- note name is not same as chemical symbol
W0	intermediate vector boson
W+	intermediate vector boson
W-	intermediate vector boson
XE	xenon nucleus
XI0 XI-	
XI*(UNSPEC)0	unspecified S= 2 baryon
XI*(UNSPEC)-	unspecified S= 2 baryon
XI(UNSPEC)0	unspecified I= 1/2, S= 2 baryon
XI(UNSPEC)-	unspecified I=1/2, S= 2 baryon
XI(1530P13)0 XI(1530)-	
XI(1820)0 XI(1820)-	
XI(1940)0 XI(1940)-	
Y0	neutral strange particle
Y*(UNSPEC)0	unspecified S= 1 baryon
Y*(UNSPEC)+	unspecified S= 1 baryon
Y*(UNSPEC)-	unspecified S= 1 baryon
Z0	neutral weak gauge boson
Z*(UNSPEC)0	unspecified exotic S= +1 baryon

INSTITUTIONS

AACH	Phys. Inst. der Tech. Hochschule	Aachen, Germany
AARH	Aarhus Univ.	Aarhus, Denmark
ABAD	Abadan Inst. of Technology	Abadan, Iran
ABLC	Abilene Christian Univ.	Abilene, TX, USA
AICH	Aichi Educational Univ.	Toyota, Aichi Pref., Japan
AKIT	Akita Univ.	Akita, Japan
ALBA	State Univ. of New York at Albany	Albany, NY, USA
ALBE	Alberta Univ., TSRC	Edmonton, Alb. Canada
ALMA	Kazakh Inst. for High Energy Physics	Alma-Ata, USSR
AMER	American Univ.	Washington, DC, USA
AMES	Ames Lab	Ames, Iowa, USA
AMST	Univ. of Amsterdam	Amsterdam, Netherlands
ANIK	Amsterdam Nikhef	Amsterdam, Netherlands
ANL	Argonne Nat. Lab.	Argonne, Ill., USA
ANPL	Athens Univ., Nucl. Phys. Lab.	Athens, Greece
ARIZ	Univ. of Arizona	Tucson, Ariz., USA
ATEN	Nuclear Res. Centre Demokritos	Athens, Greece
AUCK	Auckland Univ.	Auckland, New Zealand
BARI	Univ. di Bari	Bari, Italy
BASL	Basel Univ.	Basel, Switzerland
BEDF	Bedford College	London, England
BELG	Inst. Interuniv. des Sci. Nuclear	Bruxelles, Belgium
BERG	Fysisk Institutt	Bergen, Norway
BERL	Inst. Hochenergiephys. DAW	Zeuthen/Berlin, DDR
BERN	Univ. Bern	Bern, Switzerland
BGNA	Univ. di Bologna	Bologna, Italy
BHEP	Inst. of High Energy Physics	Beijing, China
BIEL	Univ. Bielefeld	Bielefeld, Germany
BIRK	Birkbeck College	London, England
BIRM	Birmingham Univ.	Birmingham, England
BLOO	Bloomsburg State Coll.	Bloomsburg, PA, USA
BNL	Brookhaven National Lab.	Upton, L.I., NY, USA
BOHR	Niels Bohr Institute	Copenhagen, Denmark
BONN	Univ. Bonn	Bonn, Germany
BOST	Boston Univ.	Boston, Mass., USA
BRAN	Brandeis Univ.	Waltham, Mass., USA
BRCO	British Columbia Univ.	Vancouver, Canada
BRIS	H. H. Wills Phys. Lab., U. of Bristol	Bristol, England
BROW	Brown Univ.	Providence, RI, USA
BRUX	Univ. Libre de Bruxelles	Bruxelles, Belgium
BTL	Bell Telephone Labs.	Murray Hill, NJ, USA
BUDA	Central Research Institute of Physics	Budapest, Hungary
CAEN	Lab. de Phys. Corpusculaire	Caen, France
CAGL	Calgary Univ.	Calgary., Alb., Canada
CAMB	Cambridge Univ.	Cambridge, England
CAPE	Univ. of Cape Town	Cape Town, S. Africa
CARL	Carleton Univ.	Ottawa, Canada
CASE	Case Western Reserve Univ.	Cleveland, Ohio, USA
CATH	Catholic Univ. of America	Washington DC, USA

INSTITUTIONS (CONT'D)

CAVE	Cavendish Lab., Cambridge Univ.	Cambridge, England
CBPF	Centro Bras. Pesquisas Fisicas	Rio de Janeiro, Brazil
CDEF	College de France	Paris, France
CENG	CEN, Grenoble	Grenoble, France
CERN	European Org. for Nuclear Research	Geneva, Switzerland
CHIC	Univ. of Chicago	Chicago, Ill., USA
CINC	Univ. of Cincinnati	Cincinnati, Ohio, USA
CIPP	Canadian Inst. of Particle Physics	Montreal, Canada
CIT	Calif. Institute of Technology	Pasadena, Calif., USA
CLER	Univ. de Clermont-Ferrand	Clermont-Ferrand, France
CLEV	Cleveland State Univ.	Cleveland, OH, USA
CMU	Carnegie-Mellon Univ.	Pittsburgh, PA, USA
CNRC	Canadian National Research Council	Ottawa, Canada
COLC	Colorado College	Colorado Springs, CO, USA
COLO	Univ. of Colorado	Boulder, Colo., USA
COLU	Columbia Univ.	New York, NY, USA
COPE	Copenhagen Univ.	Copenhagen, Denmark
CORN	Cornell Univ.	Ithaca, NY, USA
COSU	Colorado State Univ.	Fort Collins, CO, USA
CRAC	Inst. for Nuclear Research	Cracow, Poland
CRNL	Chalk River Nuclear Lab.	Chalk River, Canada
CUNY	City Univ. of New York	New York, NY, USA
CURI	Pierre et Marie Curie Univ., Paris VI	Paris, France
CWSH	Central Washington Univ.	Ellensburg, WA, USA
DESY	Deutsches Elektronen-Synch.	Hamburg, Germany
DLFT	Technische Hogeschool	Delft, Netherlands
DOE	Department of Energy	Washington D.C., USA
DORT	Univ. Dortmund	Dortmund-Hornbruch, Germany
DUKE	Duke Univ.	Durham, NC, USA
DUUC	University College	Dublin, Ireland
EDIN	Univ. of Edinburgh	Edinburgh, Scotland
EFI	Enrico Fermi Inst. for Nuclear Studies	Chicago, Ill., USA
ELMT	Elmhurst College	Elmhurst, Ill., USA
EPOL	Ecole Polytechnique	Palaiseau, France
ERLA	Univ. Erlangen	Erlangen, Germany
ETHZ	Swiss Federal Inst. of Technology	Zurich, Switzerland
FIRZ	Univ. di Firenze	Firenze, Italy
FKUU	Fukui Univ.	Fukui, Japan
FNAL	Fermi National Accelerator Lab.	Batavia, Ill., USA
FNRS	FNRS	Belgium
FRAS	Lab. Nazionali del Sincrotrone	Frascati, Italy
FREI	Univ. Freiburg	Freiburg, Germany
FSU	Florida State Univ.	Tallahassee, Fla., USA
GENE	State Univ. of New York, Geneseo	Geneseo, NY, USA
GENO	Univ. di Genova	Genova, Italy
GESC	General Electric R and D Center	Schenectady, NY, USA
GEVA	Univ. de Geneve	Geneva, Switzerland
GLAS	Univ. of Glasgow	Glasgow, Scotland
GMAS	George Mason Univ.	Fairfax, VA, USA

INSTITUTIONS (CONT'D)

GREN	Grenoble Univ.	Grenoble, France
GUIL	Univ. of Surrey at Guilford	Guilford, Surrey, England
HAIF	Technion - Israel Inst. of Technology	Haifa, Israel
HAMB	Univ. Hamburg	Hamburg, Germany
HARV	Harvard Univ.	Cambridge, Mass., USA
HAWA	Univ. of Hawaii	Honolulu, Hawaii, USA
HEID	Univ. Heidelberg	Heidelberg, Germany
HELS	Helsingin Yliopisto	Helsinki, Finland
HIRO	Hiroshima Univ.	Hiroshima, Japan
HOUS	Univ. of Houston	Houston, Texas, USA
HOWD	Howard Univ.	Washington, DC, USA
IDAH	Univ. of Idaho	Moscow, ID, USA
IIT	Illinois Inst. of Tech.	Chicago, Ill., USA
ILL	Univ. of Illinois	Urbana, Ill., USA
ILLC	Univ. of Illinois at Chicago	Chicago, Ill., USA
IND	Univ. of Indiana	Bloomington, Ind., USA
INNS	Innsbruck Univ.	Innsbruck, Austria
INUS	Inst. for Nuclear Study at Tokyo Univ.	Tokyo, Japan
IOAN	Univ. of Ioannina	Ioannina, Greece
IOWA	Univ. of Iowa	Iowa City, Iowa, USA
IPN	Inst. de Phys. Nucleaire	Orsay, France
IRPA	Intercampus Inst. for Res. at Part. Acc.	USA
ISU	Iowa State Univ.	Ames, Iowa, USA
ITEP	Inst. for Teor. and Exp. Physics	Moscow, USSR
JAPN	Japan Univ. Group Collaboration	Japan
JHU	Johns Hopkins Univ.	Baltimore, Md., USA
JINR	Joint Inst. for Nuclear Research	Dubna, USSR
KANS	Univ. of Kansas	Lawrence, Kansas, USA
KARL	Technische Univ. Karlsruhe	Karlsruhe, Germany
KEK	Nat. Lab for High Energy Phys., Japan	Tsukuba-gun, Japan
KFAJ	KFA Julich	Julich, Germany
KFZK	Kernforschungszentrum, Karlsruhe	Leopoldshaven, Germany
KHSU	Kharkov State Univ.	Kharkov, USSR
KIAE	Kurchatov Inst. of Atomic Energy	Moscow, USSR
KIEL	Kiel Univ.	Kiel, Germany
KIMC	Industrial Medical College	Kitakyushu, Japan
KOBE	Kobe Univ.	Kobe, Japan
KOSI	Czech. Acad. Sci. Inst. Exp. Phys.	Kosice, Czechoslovakia
KYOE	Kyoto U. of Education	Kyoto, Japan
KYOT	Kyoto Univ.	Kyoto, Japan
LALO	Linear Accelerator Lab. Orsay	Orsay, France
LANC	Lancaster Univ.	Lancaster, England
LANL	Los Alamos National Lab	Los Alamos, NM, USA
LAPP	Lapp Univ.	Annecy, France
LAUS	Univ. of Lausanne	Lausanne, Switzerland
LBL	U. C. Lawrence Berkeley Lab.	Berkeley, Calif., USA
LEBD	Lebedev Physics Inst.	Moscow, USSR
LEHI	Lehigh Univ.	Bethlehem, PA, USA
LENI	Inst. of Nucl. Phys., Akad. Nauk USSR	Leningrad, USSR

INSTITUTIONS (CONT'D)

LIBH	Lab Interuniv. Belge High Energy	Brussels, Belgium
LISB	Nova Univ. de Lisbon	Lisbon, Portugal
LIVP	Liverpool Univ.	Liverpool, England
LJUB	Univ. of Ljubljana	Ljubljana, Yugoslavia
LOIC	Imperial Col. of Science and Tech.	London, England
LOQM	Queen Mary College	London, England
LOUC	University College	London, England
LOWC	Westfield College	London, England
LPGP	Lab. de Phys. General, Univ. Paris	Paris, France
LSBF	Lisbon Inst. Fisica	Lisbon, Portugal
LSU	Louisiana State Univ.	Baton Rouge, LA, USA
LUMI	Centre Univ. de Luminy	Marseille, France
LUND	Lund Univ.	Lund, Sweden
LVLN	Univ. Catholique de Louvain	Louvain-la-Neuve, Belg.
LYON	Inst. de Phys. Nucl., Univ. de Lyon	Villeurbanne, France
MADR	Junta de Energia Nuclear	Madrid, Spain
MANI	Univ. of Manitoba	Winnipeg, Canada
MANZ	Univ. Mainz	Mainz, Germany
MASA	Univ. of Massachusetts	Amherst, Mass., USA
MCGI	McGill Univ.	Montreal, Canada
MCHS	Univ. Manchester	Manchester, England
MEXU	Univ. Nac. Autonoma de Mexico	Mexico City, Mexico
MIAM	Miami Univ.	Miami, FL, USA
MICH	Univ. of Michigan	Ann Arbor, Mich., USA
MILA	Univ. di Milano	Milano, Italy
MINN	Univ. of Minnesota	Minneapolis, Minn., USA
MINR	Institute for Nuclear Research	Moscow, USSR
MIT	Massachusetts Inst. of Technology	Cambridge, Mass., USA
MONS	Univ. de l'Etat, Mons	Mons, Belgium
MONT	Montreal Univ.	Montreal, Que., Canada
MOSU	Moscow State Univ. Inst. of Nucl. Phys.	Moscow, USSR
MPEI	Moscow Phys. Eng. Inst.	Moscow, USSR
MPIH	Max-Planck-Inst. fur Phys.-Astrophys.	Heidelberg, Germany
MPIM	Max-Planck-Inst. fur Phys.-Astrophys.	Munich, Germany
MSU	Michigan State Univ.	East Lansing, Mich., USA
MTHO	Mt. Holyoke College	South Hadley, Mass., USA
MUNI	Munich Univ.	Munich, Germany
MUNT	Technische Univ. Munich	Munich, Germany
NADI	Mohamed El-Nadi Research Center	Cairo, Egypt
NAGO	Nagoya Univ.	Nagoya, Japan
NANC	Univ. de Nancy	Nancy, France
NAPL	Univ. di Napoli	Napoli, Italy
NARA	Nara Women's Univ.	Nara, Japan
NARU	Nara Univ.	Nara, Japan
NCSU	North Carolina State U.	Raleigh, NC, USA
NDAM	Univ. of Notre Dame	Notre Dame, Ind., USA
NEAS	Northeastern Univ.	Boston, Mass., USA
NEUC	Univ. of Neuchatel	Neuchatel, Switzerland
NEVI	Nevis Lab.	Irvington-on-Hudson, NY, USA

INSTITUTIONS (CONT'D)

NIFS	Ist. di Fis. Sperimentale	Napoli, Italy
NIHN	Nihon Univ.	Tokyo, Japan
NIIG	Niigata Univ.	Niigata, Japan
NIJM	R. K. Univ. Nijmegen	Nijmegen, Netherlands
NILU	Northern Illinois Univ.	Dekalb, Ill., USA
NMXS	New Mexico State Univ.	Las Cruces, NM, USA
NNIK	Nijmegen NIKHEF	Nijmegen, Netherlands
NOVO	Inst. of Nuclear Physics	Novosibirsk, USSR
NRL	Naval Research Laboratory	Washington, D.C., USA
NRLO	Naval Research Lab	Orlando, FL, USA
NSF	National Science Foundation	Washington, D.C., USA
NTUA	National Technical Univ. of Athens	Athens, Greece
NWES	Northwestern Univ.	Evanston, Ill., USA
NYU	New York Univ.	New York, NY, USA
OAKM	Oakland Univ.	Oakland, Mich., USA
OKAY	Okayama Univ.	Okayama, Japan
OKLN	Oklahoma Univ.	Norman, OK, USA
OPEN	Open Univ.	Milton Keynes, England
OREC	Oregon State Univ.	Corvallis, OR, USA
OREG	Univ. of Oregon	Eugene, OR, USA
ORNL	Oak Ridge National Lab.	Oak Ridge, Tenn., USA
ORSA	Univ. de Paris, Fac. des Science	Orsay, France
OSAK	Osaka Univ.	Osaka, Japan
OSKC	Osaka City Univ.	Osaka, Japan
OSLO	Oslo Univ.	Oslo, Norway
OSSE	Science Educ. Inst. of Osaka Pref.	Osaka, Japan
OSU	Ohio State Univ.	Columbus, Ohio, USA
OTTA	Univ. of Ottawa	Ottawa, Canada
OXF	Oxford Univ.	Oxford, England
PADO	Univ. di Padova	Padova, Italy
PAVI	Univ. di Pavia	Pavia, Italy
PENN	Univ. of Pennsylvania	Philadelphia, PA, USA
PISA	Univ. di Pisa	Pisa, Italy
PITT	Univ. of Pittsburgh	Pittsburgh, PA, USA
PRAG	Institute of Physics, CSAV	Prague, Czechoslovakia
PRIN	Princeton Univ.	Princeton, NJ, USA
PURD	Purdue Univ.	Lafayette, Ind., USA
QUNK	Queen's Univ.	Kingston, Ont., Canada
REHO	Weizmann Inst. of Science	Rehovoth, Israel
RHEL	Rutherford High Energy Lab.	Chilton, Did., Oxon., England
RICE	William Marsh Rice Univ.	Houston, Texas, USA
RIKK	Rikkyo University	Rikkyo, Japan
ROCH	Univ. of Rochester	Rochester, NY, USA
ROCK	Rockefeller Univ.	New York, NY, USA
ROMA	Univ. di Roma	Roma, Italy
RUTG	Rutgers Univ.	New Brunswick, NJ, USA
SACL	Center d'Etudes Nuclear Saclay	Gif-sur-Yvette, France
SACR	Cal State, Sacrament	Sacramento, CA, USA
SAGA	Saga Univ.	Saga, Japan

SAIT	Saitama Univ.	Saitama, Japan
SANT	Univ. de Santander	Santander, Spain
SASK	Univ. of Saskatchewan	Saskatoon, Canada
SCUC	Univ. of South Carolina at Columbia	Columbia, SC, USA
SEOU	Korea Univ. at Seoul	Seoul, S. Korea
SERP	Inst. of High Energy Physics	Serpukhov, USSR
SHAN	Shandoong Univ.	Jinan, Shandong, China
SHEF	Univ. of Sheffield	Sheffield, Yorks., England
SHIR	Shiraz U.	Shiraz, Iran
SHMP	Univ. of Southampton	Southampton, England
SIEG	Siegen Univ.	Huttental, Germany
SIEM	Siemens Schuckertwerke AG	Erlangen, Germany
SLAC	Stanford Linear Accel. Center	Stanford, Calif., USA
SMAS	Southeastern Massachusetts Univ.	North Dartmouth, Mass., USA
SOFC	High Inst. of Chem. Tech.	Sofia, Bulgaria
SOFI	Bulgarian Acad. of Science	Sofia, Bulgaria
SRIP	State Res. Inst. Photochem. Proj.	Moscow, USSR
STAN	Stanford Univ.	Stanford, Calif., USA
STEV	Stevens Inst. of Tech.	Hoboken, NJ, USA
STOH	Stockholm Univ.	Stockholm, Sweden
STON	State Univ. of New York at Stonybrook	Stonybrook, LI, NY, USA
STRB	Centre des Res. Nucleaires	Strasbourg, France
SWRK	Inst. of Nuclear Research	Swierk, Poland
SYDN	Univ. of Sydney	Sydney, Australia
SYRA	Syracuse Univ.	Syracuse, NY, USA
TAMU	Texas A and M Univ.	College Station, TX, USA
TATA	Tata Inst. of Fundamental Research	Bombay, India
TBSU	Tbilisi State Univ.	Tbilisi, USSR
TELA	Univ. of Tel-Aviv	Tel-Aviv, Israel
TEMP	Temple Univ.	Philadelphia, PA, USA
TENN	Univ. of Tennessee	Knoxville, Tenn., USA
TEXA	Univ. of Texas at Austin	Austin, TX, USA
THES	Univ. of Thessaloniki	Thessaloniki, Greece
TMSK	Nucl. Phys. Inst., Tomsk Polytech. Inst.	Tomsk, USSR
TMU	Tokyo Metropolitan Univ.	Tokyo, Japan
TNTO	Univ. of Toronto	Toronto, Canada
TOCR	Cosmic Ray Lab, Tokyo Univ.	Tokyo, Japan
TOGA	Tohoku-Gakuin Univ.	Miyagi, Japan
TOHO	Tohoku Univ.	Sendai, Japan
TOKY	Univ. of Tokyo	Tokyo, Japan
TORI	Univ. di Torino	Torino, Italy
TRIU	TRIUMF, Univ. of British Columbia	Vancouver, Canada
TRST	Univ. di Trieste	Trieste, Italy
TSUK	Tsukuba Univ.	Ibaraki, Japan

INSTITUTIONS (CONT'D)

TUAT	Tokyo Univ. of Agriculture and Tech.	Tokyo, Japan
TUFT	Tufts Univ.	Medford, Mass., USA
UATH	Univ. of Athens	Athens, Greece
UBEL	Univ. of Belgrade	Belgrade, Yugoslavia
UCB	Univ. of Calif. at Berkeley	Berkeley, Calif., USA
UCD	Univ. of Calif. at Davis	Davis, Calif., USA
UCI	Univ. of Calif. at Irvine	Irvine, Calif., USA
UCLA	Univ. of Calif. at Los Angeles	Los Angeles, Calif., USA
UCR	Univ. of Calif. at Riverside	Riverside, Calif., USA
UCSB	Univ. of Calif. at Santa Barbara	Santa Barbara, Calif., USA
UCSC	Univ. of Calif. at Santa Cruz	Santa Cruz, Calif., USA
UCSD	Univ. of Calif. at San Diego	La Jolla, Calif., USA
UMAD	Univ. de Madrid	Madrid, Spain
UMD	Univ. of Maryland	College Park, MD, USA
UNM	Univ. of New Mexico	Albuquerque, New Mex., USA
UTAH	Univ. of Utah	Salt Lake City, Utah, USA
UTRE	University of Utrecht	Utrecht, Netherlands
UUPP	Univ. of Uppsala	Uppsala, Sweden
VALE	Univ. de Valencia	Valencia, Spain
VAND	Vanderbilt Univ.	Nashville, Tenn., USA
VASC	Virginia State Coll.	Petersburg, VA, USA
VASS	Vassar College	Poughkeepsie, NY, USA
VICT	Victoria Univ.	Victoria, BC, Canada
VIEN	Inst. for High En. Phys., A. A. S.	Vienna, Austria
VILL	SIN, Villigen Univ. High Energy Physics	Villigen, Switzerland
VIRG	Univ. of Virginia	Charlottesville, VA, USA
VPI	Virginia Polytechnic Inst.	Blacksburg, VA, USA
VRIJ	Vrije Univ.	Amsterdam, Netherlands
WARS	Univ. of Warsaw	Warsaw, Poland
WASH	Univ. of Washington	Seattle, Wash., USA
WIEN	Univ. Wien	Vienna, Austria
WILL	College of William and Mary	Williamsburg, VA, USA
WINR	Warsaw Inst. of Nuclear Research	Warsaw, Poland
WISC	Univ. of Wisconsin	Madison, Wisc., USA
WSUP	Washington State Univ.	Pullman, WA, USA
WUPP	Univ. Wuppertal	Wuppertal, Germany
WURZ	Wurzburg Univ.	Wurzburg, Germany
WYOM	Univ. of Wyoming	Laramie, Wyoming, USA
YALE	Yale Univ.	New Haven, Conn., USA
YERE	Yerevan Physics Inst.	Yerevan, Armenia, USSR
YOKO	Yokohama National Univ.	Yokohama, Japan
YORK	York University	Downsview, Ont., Canada
ZAGR	Inst. Ruder Boskovic, Zagreb	Zagreb, Yugoslavia
ZURI	Zurich University	Zurich, Switzerland

BROOKHAVEN AGS BEAMS (Source: G. Bunce, BNL)

Up to 10^{13} protons per pulse are accelerated typically to 28.5 GeV kinetic energy (31 GeV has been obtained). At 28.5 GeV, the period is 2.4 sec for slow extraction (with a 1-sec flattop), or 1.4 sec for fast extraction (used for neutrino beams). Counting rates may be estimated using the nominal beam spill time of 1 sec.

	Beam	Momentum range (GeV/c)	±Δp/p (%)	Production angle (°)	Solid angle (msr)	Beam length (m)	Particles	Flux in thousands per 10^{12} protons on target	at (GeV/c)	Comments
Separated	B4	1.5-6 1.5-9	3	3	0.3	81	K^+/K^- $\bar{p}$ π^+/π^-	270/120 100 $4\times10^4/3\times10^4$	4	Usually 2×10^{12} ppp on target; $\pi/K \sim 3$ in K beam; $\pi/\bar{p} \sim 3$-4
	B2	- same characteristics as B4 above -								To multiparticle spectrometer
	C2, C4	≤1.1	2	10.5	2.6	15	K^+/K^- $\bar{p}$ π^+/π^-	40/12 2 8×10^4	0.75	Usually 2×10^{12} ppp; $\pi/K \sim 10$ in K beam
	C6, C8	≤0.8	2.5	5	15	15	K^+/K^- $\bar{p}$ π^+/π^-	200/60 14 6×10^5	0.75	Usually 2×10^{12} ppp; $\pi/K \sim 20$
Unseparated	A1	5-24	1.5	0	0.2	130	π^-	1000	22	To multiparticle spectrometer; 10^{12} ppp; 25 cm Be target
	B1	5-24	3	0	0.3	75	K^+/K^- $p/\bar{p}$ π^+/π^-	2500/700 $1.5\times10^5/200$ $6\times10^4/3\times10^4$	10	Usually 2×10^{12} ppp
	C1	5-24	5	0	0.8	61	K^+/K^- $p/\bar{p}$ π^+/π^-	9000/400 $3\times10^4/30$ $10^5/3\times10^4$	16	Usually 2×10^{12} ppp; $\mu/\pi \sim 3\%$ in π beam
	D2	0.1-0.3(π) 0.05-0.15(μ)	9(π)	55(π)	50(π)	9	μ^-	2000	0.10	Muon channel; flux in 100 cm^2 with $\Delta p/p = \pm2\%$; design intensity
Neutral	A3	1-28		0	0.0035	8	K_L n	2000 10^5	1-28	Typically 10^{11} ppp; alternates with A1; design intensity
	B5	6-28		0	0.01	6	n	10^5	6-28	Typically 10^{12} ppp; design intensity
	U	1.5 (peak)					$\nu/\bar{\nu}$	$10^7/7\times10^6$ per m^2		Typically 9×10^{12} ppp; flux averaged over 0.7 m radius

CERN PS BEAMS [Source: *Experiments at CERN in 1982*, D.R.O. Morrison (editor)]

East Area -- These are the primary beams.

Beam	Momentum (GeV/c)	Particles	Flux/cycle	Comments
e_{15}	8-24	p	$\geq 3\times10^{12}$	Slow ejection; splits into three branches
e_{18}	≤22	p	$\geq 5\times10^{12}$	Fast ejection

East Area -- These are counter beams. They are all fed by branches of the e_{15} beam above. The fluxes are for $\Delta p/p = \pm 1\%$ and 10^{12} 24-GeV/c protons on the external target; they assume 30% target efficiency (fluxes also depend on the external target used). The first two beams are enriched by electrostatic separation.

Beam	Momentum (GeV/c)	Particles	Flux/cycle	Comments
k_{26}	≤0.55	K^-	4×10^3	Flux at 0.55 GeV/c
k_{23}	0.5-1.0	$\bar{p}$	5×10^3	Flux at 0.8 GeV/c; for tests
c_{13}	≤12	p	3×10^6	Fluxes (design values)
	"	π^+	6×10^5	at 10 GeV/c; for equipment
	≤18	π^-	2×10^5	tests
t_6	≤18	p	5×10^5	Fluxes (design values)
	"	π^+	5×10^3	at 18 GeV/c; for equipment
	"	π^-	2×10^3	tests
		π^-	3×10^5	Flux at 5 GeV/c
t_7	1-10	p, π^+, e^+		e^+ is 7% of beam at 5 GeV/c,
		π^-e^-		50% at 2 GeV/c

South Area (LEAR) -- Design values for LEAR. The flux is for a long spill of 10^9 antiprotons every 1000 sec, with a 90% duty cycle in the final stage. The antiproton beam will be split into three branches.

Beam	Momentum range (GeV/c)	Flux (per sec)	Comments
External beam,	0.3-0.6	10^6	Stage 1, Easter 83
with ultra-slow	0.2-1.6		Stage 2, end 83
ejection from LEAR	0.1-2.0		Stage 3

CERN SPS BEAMS [Source: *Experiments at CERN in 1982*, D.R.O. Morrison (editor)]

North Area Beams (NA experiments)

Beam	Maximum momentum (GeV/c)	Maximum intensity for 10^{12} protons at 400 GeV/c	Beam type
H2	400	6 $\times 10^7$ π^+ at 200 GeV/c 2 $\times 10^7$ π^- " " " 2.5$\times 10^6$ $e^\pm$ at 150 "	High energy hadrons or electrons (also enriched $K^+/\bar{p}$)
H4/E4	330	5 $\times 10^7$ π^+ at 200 GeV/c 1.5$\times 10^7$ π^- " " " 1.5$\times 10^6$ $e^\pm$ at 150 "	High energy hadrons or electrons (H4-test is an alternate test branch)
H6	200	6 $\times 10^7$ π^+ at 150 GeV/c 2.5$\times 10^7$ π^- " " "	Medium energy hadrons
H8	400	1.5$\times 10^8$ π^+ at 200 GeV/c 5 $\times 10^7$ π^- " " "	High energy hadrons (electrons)
M2	280	1.5$\times 10^7$ μ^+ at 200 GeV/c 5 $\times 10^6$ μ " " "	High intensity muons
P0	400/450	$\sim 10^{13}$ p at 400/450 GeV/c	High intensity primary protons for production of H10 or E12
H10	400/450	1.2$\times 10^9$ π^+ at 200 GeV/c 4 $\times 10^8$ π^- " " "	High energy high-intensity hadrons or protons
E12	300	1 $\times 10^8$ e total with energy > 100 GeV	Broad-band electrons/photons

West Area Beams (WA experiments) The West Area beams are being modified to higher energies. The table below gives some calculated properties of the upgraded beams, which should be available from May 1983.

Beam	Maximum momentum (GeV/c)	Intensity for 10^{12} protons at 450 GeV/c	Beam type
H1	450	8 $\times 10^7$ π at 200 GeV/c 2 $\times 10^8$ π^+ " " " 1.5$\times 10^6$ $e^\pm$ " " "	Hadrons, electrons, or attenuated protons
H3	450	4 $\times 10^7$ π at 200 GeV/c 1 $\times 10^8$ π^+ " " " 7 $\times 10^5$ $e^\pm$ " " "	Hadrons, electrons, or attenuated protons
X3	40*	10^3-10^4 tertiaries/10^7 incident H3 particles	Test beam; tertiary electrons + hadrons
X5	100**	10^3-10^4 tertiaries/10^7 incident H3 particles	Test beam; tertiary electrons + hadrons
X7	100***	10^3-10^4 tertiaries/10^7 incident H3 particles	Test beam; tertiary electrons + hadrons

*X3 can also be run with the H3 optics, on high energy secondaries.
**X5 can be run exceptionally at 300 GeV/c for calibration of the neutrino detectors.
***X7 can be run exceptionally at 150 GeV/c to BEBC.
Extra power supplies and magnets have to be taken from other beams.

CERN SPS BEAMS (continued)

West Area Neutrino Beams (WA experiments) -- Reference: CERN/EF/BEAM 80-7, A. Grant, High momentum version of the narrow-band neutrino beam N3.

Beam	Parent momentum (GeV/c)	Particle	Flux for 10^{13} incident protons†	$<E_\nu>$ (GeV)	σ_{rms} on E_ν (GeV)	Beam type
N1	450 protons	ν	$5.3\times10^{10}/m^2$ (~0.25 ev/ton)	~30		Wide-band spectrum up to 450 GeV
		$\bar{\nu}$	$2.3\times10^{10}/m^2$ (~0.25 ev/ton)	~30		
N3	380 secondaries	ν_π	1.19×10^7	88	41	Narrow-band dichromatic beam with 450 GeV primary protons
		ν_K	5.4×10^6	259	49	
	350	$\bar{\nu}_\pi$	1.4×10^7	82	37	
		$\bar{\nu}_K$	1.7×10^5	248	48	
		ν_π	3.8×10^7	80	38	
		ν_K	2.5×10^7	251	45	
	320	$\bar{\nu}_\pi$	3.2×10^7	78	35	
		$\bar{\nu}_K$	7.2×10^5	224	49	
		ν_π	1.1×10^8	78	34	
		ν_K	8.5×10^7	228	45	
	300	$\bar{\nu}_\pi$	5.3×10^7	74	32	
		$\bar{\nu}_K$	1.7×10^6	220	37	
		ν_π	1.9×10^8	73	32	
		ν_K	1.2×10^8	220	41	
	275	$\bar{\nu}_\pi$	1.1×10^7	68	29	
		$\bar{\nu}_K$	3.4×10^6	215	34	
	200	$\bar{\nu}_\pi$	4.2×10^8	55	19	
		$\bar{\nu}_K$	1.8×10^7	167	26	
		ν_π	1.0×10^9	54	20	
		ν_K	2.4×10^8	165	20	

†Fluxes for the N3 beam are at the WA1 (CDHS) detector in a circle of diameter 1.5 m.

FERMILAB BEAMS (Source: H.B. White, Jr., FNAL)

Currently, protons are accelerated to a maximum momentum of 500 GeV/c. The maximum intensity is 3×10^{13} protons per pulse, the repetition rate is 0.1/sec, and the beam spill time is 1 sec. With the commissioning of the *Energy Saver Project*, protons may be accelerated to momenta greater than 500 GeV/c. The intensity and repetition rate will be determined in practical operation. Maximum design momentum is 1000 GeV/c.

Beam	Momentum range (GeV/c)	$\pm\Delta p/p$ (%)	Production angle (mr)	Solid angle (μsr)	Particles	Flux in thousands per sec per 10^{12} protons on target	at (GeV/c)	Comments
*PW	1000 (peak)				p	$<2\times10^{13}$		Primary proton transport to PW target
PW	20-250	7	0-8	8	π^-	10^5	200	P-west secondary beam
	20-300	5	0		$\bar{p}$	1000	100	P-west secondary beam
*PW	750 (peak)				π	4×10^6	200	High intensity pion beam
					$\bar{p}$	10^4	175	P-west secondary beam
*PB	800 (peak)	15		4	e	3×10^4	500	Wide band charged and neutral beam
PE	300 (peak)	2.3	0-2	1.2	e^-	10^4	200	Also provides tagged photons
	300 (peak)		0	0.04	n	4000	>100	Also tagged photons
PC	20-350				Σ^-	2000	300	P-center charged hyperons
					Ω^-	<10	250	
ME(M1)	20-400	0.1-1.5	0-7	2	π	1000 (at 3.5mr)	200	Medium resolution beam
(M2)	20-400	0.1-1.4	0-1.5	0.2	p	3000 (at 0.6mr)	200	Presently, diffracted protons available at
					π^-	300		400 GeV/c with flux $<3\times10^{12}$ per pulse
(M3)	300 (peak)		0.3-1.1	$\sim10^{-7}$	n	200/cm^2	total	
(M4)	35-200	6	7-8	1	K^-	60	75	Presently a test beam
					π^-	100		
*ME	1000 (peak)				p	$<5\times10^9$	1000	Primary protons
*MP	70-350	0 ± 5.0	0 ± 1.0		p	10^5	600	Polarized protons from 1000 GeV/c primary
					$\bar{p}$	<7000	200	Antiprotons from 1000 GeV/c primary
	1000				p and π			Also capable of unpolarized transport
*MC	100				K_L^0 and n	2×10^5	100	Neutral beam with 1000 GeV/c primary
*MB	200 (peak)				π and K			Low intensity wide-angle test beam
*MT(M5)	100 (peak)				$\pi^\pm$			Low intensity wide-angle test beam
					$e^\pm$			to present multiparticle spectrometer

continued on next page

FERMILAB BEAMS (continued)

Beam	Momentum range (GeV/c)	±Δp/p (%)	Production angle (mr)	Solid angle (μsr)	Particles	Flux in thousands per sec per 10^{12} → protons on target	at (GeV/c)	Comments
*MW	1000 (peak)	10	0±0.7		p	6×10^{6}	600	Beam transport to possible new multiparticle spectrometer; assumes 1000 GeV/c on target
					π^+	5×10^{5}	600	
					K^+	10^{5}	600	
					π^-	1.5×10^{5}	600	
					K^-	10^{4}	500	
					$\bar{p}$	10^{4}	300	
*MT	1000 (peak)	0.1	0		p	10^{5}	1000	Temporary beam to multiparticle spectrometer (will convert to test beam)
NW(N1)	50-275	2	0-1	4-16	μ^+	150	225	To muon/hadron spectrometer, 400 GeV/c on target
	100-275				π^+	>1000		
*NW								Test beam
*NC	1000		0		p			Primary beam transport to center target
*NC-D	750 (peak)		0		$\nu/\bar{\nu}$	variable		Narrow band, sign-selected neutrino beam
*NC-T	1000 (peak)		0		$\nu/\bar{\nu}$	variable		Broad band, quadrupole focus
*NE	1000 (peak)		0		p	$\sim10^{7}$	1000	To hybrid spectrometer system
*NT	500		0-3		hadrons	$\sim10^{4}$	500	Test beam for neutrino detectors
*NP	1000		0		p	$\sim10^{10}$	1000	Proton transport to prompt neutrino detector
*NM	275-750	20			$\mu^{\pm}$	$\sim10^{4}$	750	Tevatron muon beam

*These beams will be commissioned as part of the Tevatron II project. Design characteristics are shown; detailed characteristics will be determined in operation. These beams will also replace present beams in most cases.

KEK BEAMS (Source: A. Kusumegi, KEK)

Protons are accelerated to a maximum momentum of 13 GeV/c. The maximum intensity is 4.0×10^{12} protons per pulse. The repetition rate is 0.45/sec.

Beam	Momentum range (GeV/c)	$\pm\Delta p/p$ (%)	Production angle (°)	Solid angle (msr)	Beam length (m)	Particles	Typical flux in particles per pulse →	at (GeV/c)	Comments
EP1	4-13					p	5×10^{10}		Fast extraction
EP2	4-13					p	2×10^{12}		Slow extraction; branches feed the K2, K3, and π-μ beams
π1	4-8	2	1.5	0.33	33	π^+/π^-	$2\times10^6/6\times10^5$	8	Under construction; fluxes estimated
π2	2-4.3	1	10	0.594	31.3	p/$\bar{p}$ π^+/π^-	$10^4/10^2$ $2\times10^5/1\times10^5$	3	Internal target beam; fluxes for 10^{11} ppp
T1	0.5-2.3	2	23	0.16	18.8	π^+/π^-	$5\times10^4/4\times10^3$	1	Internal target beam; fluxes for 10^{11} ppp
T2	0.5-6.0	4	15	0.35	37.0	π^+/π^-	10^4	4	
K2	1-2	3	0	1.02	27.9	K^+/K^- p/$\bar{p}$ π^+/π^-	$1.5\times10^5/5.7\times10^4$ $2\times10^7/1.2\times10^4$ $1.7\times10^7/1.4\times10^7$	2	
K3-S (K3-L)	0.5-1.0 〃	2 〃	0 〃	7.3 (3.0)	14.4 (16.5)	K^+/K^- p/$\bar{p}$ π^+/π^-	$4.2\times10^4/1.0\times10^4$ $7\times10^7/3.5\times10^2$ $5\times10^7/5\times10^7$	0.6 0.8 0.8	Fluxes are for the S (short) mode of operation
π-μ	0.1-0.45		87	20		$\pi^\pm$ $\mu^\pm$	10^6 10^4	0.15	

LAMPF PARTICLE PHYSICS BEAMS (Source: D. Dodder, Los Alamos)

The primary 800 MeV H^+ beam normally runs with an average current up to 700 μA, but 1.2 mA has been achieved. The macro duty factor is 6 to 9%, with a macrostructure of 120 pps with a maximum pulse length of 750 μs. Each macropulse consists of a 0.25 ns burst every 5 ns. This beam is used to generate the meson and neutrino beams described below, as well as additional beams for other purposes. Simultaneously with the H^+ beam a low current (5 μA unpolarized; up to 25 nA polarized) H^- beam is accelerated to a desired energy between 212 and 800 MeV with a duty factor of 3 to 9%.

	Beam	Momentum (MeV/c)	$\pm\Delta p/p$ (%)	Solid angle (msr)	Particle	Flux in particles/sec or current	at (MeV/c)	Comments
Main Exp. Area	A	1460	0.1		p	700 μA	1460	Main beam; 1.2 mA has been achieved
	LEP	77-415	0.05-2.8	0-17	π^+	7×10^8	195	Low energy pion beam; achromatic;
					π^-	$\sim2\times10^8$		flux at $\Delta p/p = 2.8\%$
	EPICS	156-415	2.0	3.4	π^+	1.5×10^8	300	Energetic pion channel
					π^-	3.3×10^7		and spectrometer
	P^3	100-750	5.0	7.0	π^+	2×10^9	470	High energy pions; achromatic
		"			π^-	3×10^8	470	
		28			μ^+	1.5×10^6	28	
		100			μ^-	0.8×10^6	100	μ^- flux is without degrader
	Stopped muon	25-250			μ^+	1.4×10^8	130	
					μ^-	2.8×10^7		
Area B		665-1460			p	5 μA	1460	Current reduced to 1/3 for <1460 MeV/c
		"			$\vec{p}$	20 nA		Polar. = 0.8 N.L.S available
		<1460	0.8		$\vec{n}$	10^4		Polar. = 0.5; max 0° is given;
		"	0.8		n	10^7		additional ports up to 37° give lower energies
								"Unpolarized" beam has P = 0.2 at 20°
	External proton beam	665-1460	<0.1	<<6	p	<100 nA	1460	H^- beam stripped to H^0 or H^+
					H^0	"		
					H^-	"		
					$\vec{p}$	10 nA		Polar. = 0.8 available in N.L.S
					$\vec{H}^0$	"		directions; independent of polarization
					$\vec{H}^-$	"		direction of internal beam
Area C	HRS	475-1460	0.26		p	2μA		For high resolution proton spectrometer
					$\vec{p}$	10nA		
	Neutrino facility	0-53		$\sim4\pi$ sr	ν_e	3×10^{14}	total	Peak momentum is 35 MeV/c for ν_μ
					ν_μ	"		Flux at 8 m is 4×10^8 ν/cm^2-sec
					$\bar{\nu}_\mu$	"		Source subtends $\pm1.5°$ for target 8 m away

SERPUKHOV BEAMS (Source: Yu.G. Ryabov and V.V. Ezhela, Serpukhov)

Protons are accelerated to a maximum momentum of 70 GeV/c. The intensity is about 3×10^{12} protons per pulse. The repetition rate is 0.2/sec, and the beam spill time is about 2 sec.

Beam	Momentum range (GeV/c)	±Δp/p (%)	Production angle (mr)	Solid angle (μsr)	Beam length (m)	Particles	Typical flux in particles per pulse	at (GeV/c)	Comments
2/14	30-70	1	6-35	10	120	hadrons+	10^6	60	Internal target lines
	30-60	1	0-5	30		hadrons	10^6	60	2A, 2B, 14; the e⁻'s may
	5-45	3	0-7	30		e⁻	10^6	30	be used for polarized γ's
4	20-50	1	0-5	40	130	hadrons	6×10^6	40	Internal target lines 4A, 4B, 4V, 4I, 4F
18	3-17	2	0-200	120	50	hadrons+	10^8	5	Internal target,
	2-14	2	240-400	80		hadrons	10^4	8	injection in ring
20	0.4-3.2	1	0	2800	20	hadrons±	10^8	1	External target, fast ejection
19	70		0			p	10^{12}	70	Slow ejection
4N	≤70		12	1	40	neutrals	10^7	total	Internal target
7	30-70	0.25	11.5	1-4	511.5	p	10^6	69	Internal target, unseparated
	20-50	0.25	0	40		π^+, K^+, $\bar{p}$	5-10		Fast ejection, separated
	20-55	0.25	0	10		π^-	5-10		Fast ejection, unseparated
9	<25	0.5	0	30	194	$\pi^\pm$, $K^\pm$, $\bar{p}$, d	5		Fast ejection, separated
	10-13	1	0	30		$\bar{d}$	8	12.2	Separated
8	<40 (mean=6)		0	2500	500	ν, $\bar{\nu}$	5×10^9	total	Wide-band neutrino beam

SIN BEAMS (Source: SIN Users' Handbook, 1981)

The average energy of the primary proton beam is 589 MeV with a FWHM spread of 0.4 %. The pulse rate is 5×10^7 per sec and the pulse width is 1 nsec. The maximum intensity at extraction is about 170 μA.

Pion Beams

Beam	Energy range (MeV)	Minimum $\pm\Delta p/p$ (%)	Maximum flux (per sec)	for maximum flux: Energy (MeV)	for maximum flux: $\pm\Delta p/p$ (%)	for maximum flux: FWHM spot size H×V (cm)
πE1	50-350	0.2	π^+ 9×10^9 π^- 8×10^8	225	2.5	2×5
πE3	40-125	1.0	π^+ 7×10^8 π^- 1.3×10^8	85	5.0	5.6×2.6
πM3	50-350	0.1	π^+ 1×10^8 π^- 9×10^6	225	3.0	4×2
πM1	50-350	0.05	π^+ 3×10^7 π^- 3×10^6	225	1.0	0.9×0.7

Muon Beams (μ^+ fluxes are 4 or 5 times μ^- fluxes)

Beam	Momentum (MeV/c)	μ^- flux (per sec)	Δ-range (g/cm)	Stop density μ^- (stops/g-sec)	e^-/μ^- ratio	Burst width (nsec)	FWHM spot size H×V (cm)
μE1	120-50	3×10^7-4×10^5	4-0.3	1×10^5-3×10^4	0.01-3	$\gtrsim$4	6×4
μE2	125-50	10^7-10^5	2-0.15	4×10^4-1×10^4	0.01-3	$\gtrsim$4	10×6
μE3	stopping			3.5×10^6			
μE4	stopping			2×10^5	0.3(π^-/μ^-)		
πE3	28	$10^7(\mu^+)$	0.04	$2\times10^7(\mu^+)$	0.1(e^+/μ^+)		5×4

Polarized Proton Beam (pM1)

Mode of operation	Energy (MeV)	Polarization (%)	Flux (per sec)
Scattered from target M	590-225	38	10^{10}-3×10^7
Polarized ion source	590	80	6×10^{11}

Neutron Beam (nE1)

Energy range (MeV)	Intensity in 25 cm^2 spot (per MeV-sec)	Available flight path (m)	Resolution from T.O.F. at 590 MeV (MeV)
590-200	4×10^5-1.4×10^5	60	7

SLAC BEAMS (Source: T. Fieguth, SLAC)

Accelerator mode	Particles	Momenta (GeV/c)	Particles per pulse	Pulse length (μs)	Repetition rate (Hz)	Comments
Normal	e^-	≤23.5	$\leq 5\times10^{11}$	1.6	≤360	To conserve power, repetition rates rarely exceed 180 Hz. The e^+ beam would require reinstallation of a high-power source.
	e^+	≤15.0	$\leq 2\times10^{10}$	1.6	≤90	
SLED	e^-	≤33.5	10^{11}	0.2	≤360	

Colliding beams	Particles	C.m. energy (GeV)	Peak luminosity ($cm^{-2}\,sec^{-1}$)	Average luminosity ($cm^{-2}\,sec^{-1}$)	Comments
SPEAR	e^+e^-	2-7.4	2×10^{31} at 6.4 GeV	8×10^{30}	SPEAR has 2 interaction regions. PEP 6
PEP	e^+e^-	8-36	1.7×10^{31} at 29 GeV	8×10^{30}	At PEP, the luminosity scales as E^{-2} (E^{-3}) for c.m. energies below (above) that at the peak

Beam	Momentum range (GeV/c)	$\pm\Delta p/p$ (%)	Production angle (°)	Solid angle (msr)	Particles	Maximum particles per pulse	at (GeV/c)	Repetition rate (Hz)	Facility	Comments
21	1-16	≤4.0	1	0.03	K^+/K^-	17/8	10	≤180	LASS	Separated $\pi/K\approx1/30$ $\pi/\bar{p}\approx1/14$
					$p/\bar{p}$	40/6				
					π^+/π^-	10^3				
					e^-	10^4				
	1-8				e^+	10^4	2.5			
27	20	9.0 FWHM	0	10^{-7}	γ	10^2	20	≈20	40° b.s. hybrid facility	Backscattered laser beam
3	≤15	0.1-1.0			e^+	2×10^{10}	All	≤90	ESA	e^+ beam requires high
	≤23.5	0.1-1.0			e^-	5×10^{11}	All	≤360	1.6, 8, & 20 GeV/c spectrometers	power source; all fluxes at $\Delta p/p = \pm0.25\%$
	3.237 j (j=1,...,6)	0.1-1.0			e^-	5×10^{11}		120, 180		See footnote A
	3.237 j (j=1,...,6)	≥0.5			e^-	10^9		≤360		See footnote B
	≤21.5	Brems.	0		γ	4×10^9 EQ	20	≤360		0° bremsstrahlung
	5-15	7-10	0		γ	5×10^7 EQ	All	≤360		See footnote C
	≤21.5	Brems.	0		γ	2×10^8 EQ		≤360		See footnote D
6	0.1-16	≤2.0	1.6-6	0.03	e^-	10		≤60	Test beam	
	1-16				π^-	10				
19	1-16	0.25	0		e^+	10	10	≤60	Test beam	Very pure; σ_x = 1 mm

A. High intensity source; longitudinal polarization ≈ 0.4

B. *Low intensity source; longitudinal polarization ≈ 0.85*

C. Coherent bremsstrahlung, linearly polarized (10^9 EQ without collimation)

D. Linearly polarized at maximum energy by coherent pair production in graphite

TRIUMF BEAMS [Source: Status of TRIUMF Plans for Development, G. Dutto, E.W. Blackmore, and M.K. Craddock, TRI-82-PP-37 (October 1982)]

The cyclotron energy range is 180-520 MeV with an energy spread of 0.1% (FWHM). The unpolarized intensity is 150 μA, and the polarized intensity is 300 nA; the polarization is 75-82%. The BL4/BL1A split ratio is $1/10^4$. The phase width is variable from 0.5 to 6 ns. The pulse separation is 43 or 217 ns. There are plans to upgrade various performance levels.

Main beam lines

Beam	Particle	Energy (MeV)	Intensity	Momentum spread FWHM (%)	Polarization (%)	Spot size H×V(cm)
BL1A	p	180-520	120μA (500 MeV)	0.2	0	0.2×0.5
BL4/1B	$\vec{p}$	180-520	300nA	0.2	70-80	0.2×0.5
BL4A	$\vec{n}$	160-500	10^8/sec	1.0	40-75	6×6
BL2C	p	65-100	10μA	0.2	0	1×2

Secondary lines The M8, M9, and M20 fluxes are for full momentum acceptance with 100μA of protons on a 10-cm Be target. The M11, M13, and M15 fluxes are for full momentum acceptance with 100μA of protons on a 1-cm C target. Beams of π^- and μ^- have the same properties as the π^+ and μ^+ beams, except fluxes are about 5 times lower.

Beam	Particle	Momentum (MeV/c)	Particle flux (per sec)	→ at (MeV/c)	Momentum spread FWHM (%)	Polarization (%)	Spot size H×V(cm)
M8	π^-	0-220	1.3×10^8	180	13	--	1×2
M9	μ^-	30-150	10^6	77	14	50	8×8
	π^+	30-250	2×10^8	120	14	--	10×2
M20	μ^+	30-200	2.5×10^6	30	5	>90	4×3
			2×10^6	85	8	75	8×8
M13	π^+	30-130	5×10^7	130	10	--	3×2
	μ^+	30 (surface)	1.3×10^6	30	10	>90	3×2
M11	π^+	90-470	5×10^6	200	3	--	2×3
M15 (design)	μ^+	30 (surface)	1.6×10^6	30	12	>90	2×1