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AGS EXPERIMENTS - 1988, 1989, 1990

J.C. Depken

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AGS Department

BROOKHAVEN NATIONAL LABORATORY

Associated Universities, Inc.

Upton, Long Island, New York 11973

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MASTER

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AGS Experiments - 1988, 1989 and 1990

This report contains:

Page

- 1. • Experimental Areas Layout
- 2. • Table of Beam Parameters and Fluxes
- 3. • Experiment Schedule "as run"
- 4. • Experiment Long Range Schedule
- 5. • A listing of experiments by number
- 11. • Two-page summaries of each experiment begin here,
also ordered by number
- 109. • Publications of AGS experiments
- 127. • List of experimenters

This is a *seventh edition*. Please forward suggestions and changes for future editions to:

Division Head, EP&S Division
Brookhaven National Laboratory
Building 911B
Upton, New York 11973

The cutoff date for approved experiments to be included in the report was July 1, 1990.

Flux/10¹² protons on target

Beam	GeV/c	p/p(%) (FWHM)	Prod. Angle	(msr)	K ⁺	K ⁻	p	$\bar{p}$	π^+	π^-	θ GeV/c	Purity	Remarks
B2, B4	1.5-6(K) 1.5-9($\bar{p}$)	5	3°	0.3	2.7x10 ⁵	1.2x10 ⁵	2x10 ⁷	10 ⁵	4x10 ⁷	3x10 ⁷	4	π^-/K^-3 $\pi/\pi^-3/4$	To MPS
C2, C4	<1.1	4	10.5°	2.6	9x10 ⁴	3.2x10 ⁴	2x10 ⁷	2x10 ³	8x10 ⁷	8x10 ⁷	0.75	π^-/K^-10	L=15m. Remove after FY91 run
C2', C4'	<0.8	4	0	12	3x10 ⁵	1x10 ⁵	1x10 ⁸	1.4x10 ⁴	6x10 ⁸	6x10 ⁸	0.80	$\pi^+/K^- < 1$	L=18m. Construction FY91-92
C6, C8	<0.8	5	5°	10.0	3x10 ⁵	1.0x10 ⁵	1.0x10 ⁸	1.4x10 ⁴	6x10 ⁸	6x10 ⁸	0.7	$\pi^-/K^- -5$	L=15m.
D6, D8	1.0-2.0	6	5°	1.6	1.1x10 ⁶	0.5x10 ⁶	2x10 ⁷	5x10 ⁵	6x10 ⁷	5x10 ⁷	1.8		L=31m. Commission in FY91

Unseparated Charged Beams

A1	5-28	3	0°	0.2						10 ⁶	22		To MPS: L=130m
A2	1-10	5	12°	0.3			3x10 ⁶		3x10 ⁶		2		Test Beam.
A3	1-28	4	0°	0.10			6x10 ⁷		1x10 ⁷	4x10 ⁶	14		Test Beam, commission in FY91
													Alternates with A1, can transport heavy ions
B1	5-28	3	0°	0.05			3x10 ⁷		6x10 ⁶	2x10 ⁶	14		Primarily heavy ions.
C1	1-20	5	0°	0.8	6x10 ⁶	7x10 ⁵	2x10 ⁸	1.4x10 ⁵	7x10 ⁷	5x10 ⁷	13		L=61m, or with C5
C5	1-28	2	0°	0.15			1x10 ⁷			13			L=81m. Primarily heavy ions

Neutral Beams

					K _L	n						
B5	2-15		1-4.5(V)	0.1			5x10 ⁷	3x10 ⁸		2-15		Based on FY91 est; L=10m.

Muon Channel

					μ^+							
D2, D4	.025-	9($\pi^\pm$)	135°	24($\pi^\pm$)	2x10 ⁵							Possible commissioning in FY91
	.15(μ)	30(μ)	($\pi^\pm$)		10 ³ surface				0.20	$e^-/\mu^- = 8$		

Neutrino Beams

					Neutrinos		Antineutrinos					
U line					2x10 ⁹ /m ² 10 ⁷ /m ²		1.4x10 ⁹ /m ²			1.4x10 ¹³ ppp typical on target		Fast spill, flux avg over 1.5m radius Wide Band Horn, $\langle E_{\nu} \rangle = 1.4 \text{ GeV/c}$ Narrow Band Horn, $\langle E_{\nu} \rangle = 1.3 \text{ GeV/c}$ $\Delta E/E = \pm 15\%$

					π^+		μ^+					
V1 line 3.0	0.6	0°			3.2x10 ⁷		4x10 ³		3.0			Fast spill for injection into g-2 ring, available FY1993

Note that 0° beams can be used for polarized protons and/or heavy ion beams.

RUNNING

PARASITIC RUNNING

06人E

FY90 AGS SCHEDULE

RUNNING
 PARASITIC RUNNING
 FACILITY COMMISSIONING

- SUBJECT TO CHANGE -
(100 HOURS PER WEEK)

BY: P. PLE
DATE: 1-2-90

FY90

[illegible]

AGS MODES
 SEB = SLOWLY EXTRACTED BEAM
 FEB = FAST EXTRACTED BEAM
 SEE = SINGLE BUNCH EXTRACTION
 P.P. = POLARIZED PROTONS
 H.O.S. = IONS AT 14.5 GV/c
 S = SHUTDOWN
 * = STARTUP

♦ ♦ ♦ List of Experiments ♦ ♦ ♦

<i>Experiment</i>	<i>Collaboration Spokesman</i>	<i>Experiment Title</i>	<i>Page</i>
774	Houston/BNL/New Mexico/Vassar Hungerford	Search for Σ -Hypernuclear Levels in ${}^4\text{He}$	13
777	BNL/Yale/Washington/SIN Zeller	Search for the Rare Decay Mode $K^+ \rightarrow \pi^+ \mu^+ e^-$	15
780	BNL/Yale Schmidt/Morse	A Search for the Flavor Changing Neutral Currents $K_L^0 \rightarrow \mu^+ e^-$ and K_L^0 $\rightarrow e^+ e^-$	17
781	BNL/MIT/Houston/Carnegie- Mellon/Vassar/NYU Deutsch/May	Spin Dependence of the Lambda Nucleus Interaction Determined by Observation of Hypernuclear Gamma Rays.....	19
782	Michigan/BNL/Maryland/MIT/ Notre Dame/DOE/Rice/Texas A&M/ETH Zurich Krisch	Spin-Spin Effects in Medium and High $P_{\perp}^2$ Elastic p-p Scattering.....	21
787	BNL/LANL/Princeton/TRIUMF Littenberg/Smith/Bryman	A Study of the Decay $K^+ \rightarrow \pi^+ \nu \bar{\nu}$	23
788	Carnegie-Mellon/BNL/Houston/ New Mexico/Vassar Barnes/Franklin	The Four Fermion Weak Interaction and the Decay of ${}^4_{\Lambda}\text{He}$ and ${}^5_{\Lambda}\text{He}$	25
791	UC-Irvine/UC-Los Angeles/ LANL/Pennsylvania/Stanford/ Temple/William & Mary Cousins/Molzon	A Study of Very Rare K_L Decays.....	27
793	University of California at Berkeley Price	Search for Fractionally Charged Nuclei in 15A GeV Sulfur-Oxygen Collisions.....	29

<i>Experiment</i>	<i>Collaboration Spokesman</i>	<i>Experiment Title</i>	<i>Page</i>
794	Michigan/BNL/Maryland/Notre Dame/DOE/Rice/Texas A&M/TRIUMF/ETH-Zurich Krisch	One-Spin Effects in $p + p \rightarrow p + p$ at high P_1^2	31
802	ANL/BNL/Buenos Aires/Columbia/Hiroshima/Kyushu/LBL/MIT/Tokyo-INS/UC-Riverside Chasman/Nagamiya	Studies of Particle Production at Extreme Baryon Densities in Nuclear Collisions at the AGS.....	33
808	Inst. of Nuclear Physics (Krakow)/Louisiana State/Minnesota Waddington	Interactions of 14.1 GeV/amu nuclei from 160 to ^{197}Au in light and heavy targets.....	35
810	BNL/CCNY/Johns Hopkins/Rice Lindenbaum/Platner	A Search for Quark Matter (QGP) and Other New Phenomena Utilizing Heavy Ion Collisions at the AGS....	37
813	Carnegie-Mellon/Birmingham/BNL/Freiburg/Kyoto/Kyoto-Sangyo/LANL/Manitoba/New Mex/CEN Saclay/TRIUMF/Vassar Franklin/Barnes	Search for a Strangeness -2 Dibaryon.....	39
814	BNL/CERN/LANL/McGill/New Mexico/Pittsburgh/SUNY-Stony Brook/Tel-Aviv/Texas A&M/Yale Braun-Munzinger	Study of Extreme Peripheral Collisions and of the Transition from Peripheral to Central Collisions in Reactions Induced by Relativistic Heavy Ions.....	41
815	Lebedev/Panjab/Tashkent/Jaipur/Jammu/Washington/Hua Zhong Normal/Physical-Tech. Inst-Tashkent/Phillips/LBL/Lund/NRC of Canada/Shanxi Norm/Academica Sinica Otterlund	Study of Particle Production and Nuclear Fragments in Collisions of Heavy Ion Beams with Emulsion Nuclei.....	43

<i>Experiment</i>	<i>Collaboration Spokesman</i>	<i>Experiment Title</i>	<i>Page</i>
817	Rice/BNL/J.Hopkins/Minnesota Bonner/Roberts	Polarization Transfer in Hyperon Production.....	45
818	BNL/Indiana/SE Mass/Rice Chung	Search for a J^{PC} Exotic Hybrid Meson.....	47
819	Iowa State Hill	Electromagnet Dissociation of ^{59}Co and ^{197}Au by 15 GeV/Nucleon ^{16}O and ^{32}S	49
820	Florida St/BNL/INS-Tokyo/MIT/ Ohio St/Osaka/Texas A&M/ TRIUMF/Houston/Vassar Piekarz	Search for $S = -1$ Dibaryon Resonance in the Mass Region (2.05-2.15) GeV/c ² Using the Reaction $^3\text{He}(K^-, \pi^+)nX$	51
821	Boston/BNL/Case Western/ CCNY/Cornell/Fairfield/ Heidelberg/LANL/Tokyo/KEK/ Riken/INP, Novosibirsk/Yale Hughes/Roberts	A New Precision Measurement of the on g-2 Value at the Level of 0.35 PPM.....	53
825	Oregon St/BNL/Purdue/ Studsvik Loveland	Radiochemical Studies of Ultra- relativistic Nuclear Collisions.....	55
826	Saga/Tohoku/Nagoya/Osaka/ Sagami/Gifu/Utsunomiya/ Kanagawa Itoh	Exclusive Experiment of High Energy Nuclear Reactions Induced by ^{32}S Ions with 15 GeV/N at BNL AGS.....	57
828	LANL/William & Mary/BNL/ G.Mason/Rutgers/Houston/ Vassar/Virginia St Liu/Funsten/Chrien	Search for η -Mesic Nuclei with the (π^+ , p) Reactions at 0.85 GeV/c.....	59
829	Houston/Brandeis/BNL/MIT/ Osaka/Texas/Vassar Kishimoto	Search for an $S = -1$ Three-Body Bound System.....	61

<i>Experiment</i>	<i>Collaboration Spokesman</i>	<i>Experiment Title</i>	<i>Page</i>
831	Tokyo and INS/Kobe/BNL Shida	Search for the Hypernuclear Projectile Fragments in the Relativistic Heavy- Ion Collision Using an Emulsion Chamber.....	63
835	Tel-Aviv/BNL Piasetzky/Chrien	Kaon-Nucleus Total Cross Section Measurements and Partial Decon- finement in Nuclei.....	65
836	Birmingham/BNL/Carnegie- Mellon/Freiburg/Kyoto/Kyoto- Sangyo/LANL/Manitoba/New Mex/ CEN Saclay/TRIUMF/Vassar Franklin/Barnes	Search for a Strangeness -2 Dibaryon Using a ^3He Target.....	67
838	BNL/Minn/SE Mass/Penn St Bunce/Russell	90° Exclusives at 6 GeV.....	69
839	BNL/IBM Bermon/Prodehl	A Search for Magnetic Monopoles.....	71
840	Rochester/BNL/Fermilab/ CERN/Trieste Melissinos	Search for the Coherent Production of Light Scalar and Pseudoscalar Particles.....	73
842	BNL/Minnesota/Penn St/ Southeastern Massachusetts Shupe/Makdisi	Measurement of the Analyzing Power in pp Elastic Scattering at 22 GeV/c and High Momentum Transfer.....	75
844	BNL/Oregon State Cumming	Measurement of Angular Distributions for Fragments in the Target Rapidity Region.....	77
845	BNL/Yale/Vassar Morse/Schmidt	A Search for the Rare Decay K^0 $\rightarrow \pi^0 e^+ e^-$	79
847	SUNY at Buffalo Jain	Study of Particles Production in Heavy-Ion Collisions.....	81

<i>Experiment</i>	<i>Collaboration Spokesman</i>	<i>Experiment Title</i>	<i>Page</i>
849	AT&T Bell Laboratories	Search for Muonium to Antimuonium Conversion.....	83
850	BNL/Michigan/Minnesota/ Mt. Holyoke/Penn State/ SE Massachusetts/Tel-Aviv	EVA, A Solenoidal Detector for Large Angle Exclusive Reactions--Determining Color Transparency to 22 GeV/c.....	85
851	BNL/PSI/Washington/Yale Zeller	Proposal to Study the Decay $K^+ \rightarrow \pi^+ e^+ e^-$	87
852	BNL/Indiana/Louisville/ SEMass/Notre Dame/Washington/ Moscow St. Chung/Dzierba	Search for Mesons with Unusual Quantum Numbers.....	89
854	Rice/LANL/BNL/CCNY/ Johns Hopkins Bonner/Kruk	Antiproton-Nucleus Interactions at 5-10 GeV/c.....	91
855	BNL/ORNL/CERN Woody/Shapira	Proposal to Study Low Energy Photon Production in Proton Nucleus Collisions at the AGS.....	93
856	BNL/Case Western Res/Harvard Cyclotron Lab/Loma Linda/ Massachusetts/Syracuse/SUNY Health Center Kalogeropoulos	Exploration of the Biomedical Potential of Antiprotons.....	95
857	Birmingham/Oxford/Boston/ British Columbia/BNL/Case Western Reserve/CRIP- Budapest/TRIUMF/New Mexico Lowe/Roberts	π^0 Pair Production Near Threshold and Chiral Symmetry Breaking.....	97
858	UC-SSL/Boston/BNL/UC-Los Angeles/KEK/Waseda/Tokyo/ J.Hopkins/LSU/LBL/Columbia Crawford	Measurement of Negative Particle Yield at 0°K for 15A GeV Si + Au Collisions.....	99

<i>Experiment</i>	<i>Collaboration Spokesman</i>	<i>Experiment Title</i>	<i>Page</i>
859	ANL/BNL/Columbia/Hiroshima/ INS-Tokyo/Kyushu/MIT/UC-SSL/ UC-Riverside/Tokyo Ledoux/Remsberg	Studies of High-Density Baryon Mat- ter From Extended Measurements of Particle Momentum Distributions and From High-Precision Two-Particle Correlations.....	101
862	Iowa St/BNL/Michigan St Hill	Electromagnetic Dissociation of ^{59}Co and ^{197}Au by ^{139}La and ^{197}Au	103
863	Hua-Zhong /IHEP-Alama-Ata/ IHEP-Beijing/INP-Tashkent/ Jaipur/Jammu/LBL/Lebedev/ Lund/NRC,Canada/Panjab/ Phillips/Physical-Tech Inst- Tashkent/Shanxi/Washington Wilkes/Otterlund	Au Beam Exposures for E815 (Particle Production and Nuclear Fragmentation in Collisions of Heavy Ions in Nu- clear Targets at AGS Energies.....	105
865	BNL/SIN/Yale Zeller	Proposal to Perform an Improved Search for the Decay $K^+ \rightarrow \pi^+ \mu^+ e^-$	107
866	ANL/BNL/Columbia/Hiroshima/ INS-Tokyo/Kyushu/LLL/MIT/ US-SSL/UC-Riverside/Tokyo Chasman/Hamagaki	Studies of Particle Production at High Baryon Density Using the Au Beam.....	109

SUMMARIES of Experiments

NO CHANGE

Experiment 774 - Search for Σ -Hypernuclear Levels in ^4He

University of Houston	E.V. Hungerford, B.W. Mayes, H. Piekarz, L.S. Pinsky
Brookhaven National Laboratory	S. Bart, R. Chrien, P. Pile
University of New Mexico	B. Bassaleck
Vassar College	R. Stearns
Spokesman:	E.V. Hungerford

The question of narrow (2 MeV) structure in sigma hypernuclei is not completely resolved. This structure is much narrower than theoretical estimates which range from 13 to 80 MeV, and has led to much theoretical speculation as to a mechanism that could suppress the strong conversion process, $\Sigma N \rightarrow \Lambda N$, within the nucleus. The $^{12}\Sigma\text{B}$ spectrum has been measured in Exp. 774. Earlier published results indicated narrow peaks (2 MeV) in the spectrum. There is no evidence for this structure in this data. All the spectra are reminiscent of final state enhancements and very similar to a spectrum calculated using the continuum shell model. In addition, there is no significant structure below threshold which should be evident if the strong conversion width is suppressed. Thus, the extraction of sigma spin-orbit strength from these data, as has been previously done, is probably incorrect. This leaves open the whole question of a sigma spin-orbit interaction.

LEFT SIDE

777

RIGHT SIDE

Experiment 777 - Search for the Rare Decay Mode $K^+ \rightarrow \pi^+ \mu^+ e^-$

Brookhaven
National Laboratory

H.A. Gordon, D.M. Lazarus, P. Rehak

Yale University

C. Alliegro, C. Campagnari, P.S. Cooper, N. Hadley, A. Lee,
M. Zeller

University of
Washington

V. Chaloupka, E. Jagel, H.J. Lubatti, T. Zhao

Schweizerisches
Institut für
Nuklearforschung

J. Egger, W.D. Herold, H. Kasper

Spokesman:

M.E. Zeller

This is a proposal to measure the branching ratio of the decay $K^+ \rightarrow \pi^+ \mu^+ e^-$ with a statistical sensitivity of 5×10^{-12} and systematic sensitivity of better than 10^{-11} . The apparatus involves a high flux, unseparated K^+ beam with momentum 6 GeV/c and a spectrometer which measures the momentum and species of the final state particles. The beam design is based on an existing beam modified to reduce the number of ambient muons passing through the detector. In addition to high kaon fluxes, 2×10^7 /machine pulse, features of the experiment that make such sensitivity possible are the low probability of a negatively charged electron and a muon from a K^+ decay, i.e. a good trigger signature, and the ability for good particle identification at low energies. The apparatus is thus designed around good electron identification employing atmospheric pressure Cerenkov counters and a lead scintillator shower detector.

In addition to $K^+ \rightarrow \pi^+ \mu^+ e^-$, the experimenters will collect several hundred times the present data sample for the reaction $K^+ \rightarrow \pi^+ e^+ e^-$. This will enable them to study the Dalitz plot distribution for this decay and look for possible $e^+ e^-$ state in the mass range $140 < M_{ee} < 340$ MeV.

Experiment 780 - A Search for the Flavor Changing Neutral Currents
 $K^0_L \rightarrow \mu + e$ and $K^0_L \rightarrow e^+ e^-$

Brookhaven National
 Laboratory

R.K. Adair, E. Jastrzembski, R.C. Larsen, L. Leipuner,
 W.M. Morse

Yale University

H. Greenlee, H. Kasha, E. Mannelli, M. Mannelli, K. Ohl,
 S.F. Schaffner, M.P. Schmidt, C.B. Schwarz

Spokesmen:

M.P. Schmidt and W.Morse

This experiment is to be conducted in the A3 external proton beam using a flux of about 10^{12} protons per pulse at $E_p = 24$ GeV.

The basic detector consists of sets of mini-drift chambers placed about a 72D18 magnet to form a spectrometer, an atmospheric pressure hydrogen Cerenkov Counter, a large lead glassray, and iron/scintillator range stack.

The experimenters intend to search for the transition $K^0_L \rightarrow \mu e$ and $K^0_L \rightarrow e^+ e^-$ with a sensitivity to branching ratios larger than 10^{-10} . These flavor changing neutral currents are highly suppressed in the Standard Model, and the observation of these decays would imply the existence of new interactions.

Limits were set:

$$B(K^0_L \rightarrow \mu e) > 1.9 \times 10^{-9} \quad (90\% \text{ C.L.})$$

$$B(K^0_L \rightarrow e^+ e^-) > 1.2 \times 10^{-9} \quad (90\% \text{ C.L.})$$

$$B(K^0_L \rightarrow \pi^0 e^+ e^-) > 3.2 \times 10^{-7} \quad (90\% \text{ C.L.})$$

The BNL Hypernuclear Spectrometer System as configured during the initial running phase of E781. Since then the Pion Spectrometer has been moved from the LESB-I beam line to the LESB-II beam line. The Kaon Spectrometer is now comprised of the end elements of LESB-II. The target is surrounded with either intrinsic germanium detectors or NaI detectors.

*Experiment 781 - Spin Dependence of the Lambda Nucleus Interaction
Determined by Observation of Hypernuclear Gamma Rays*

Brookhaven National Laboratory	S. Bart, R.E. Chrien, M. May, P. Pile
Massachusetts Institute of Technology	M. Deutsch
University of Houston	E.V. Hungerford, B. Mayes, L. Pinsky
Carnegie-Mellon University	P. Barnes
Vassar College	R.L. Stearns
New York University	B. Budick
Spokesmen:	M. Deutsch and M. May

This is a proposal to measure the γ -ray transitions between hypernuclear states which differ only by the orientation of the Λ spin with respect to the angular momentum of the nuclear core. This directly measures the spin dependence of the Λ nucleus interaction independent of any model. We expect these spin dependent splittings to be less than 300 keV. Germanium detectors will be used to observe the γ rays in coincidence with a pure sample of hypernuclear events in a narrow range of excitation energy selected by the hypernuclear spectrometer in LESBI at the AGS. This proposal continues the research begun in Experiment 760, the first experiment to utilize this $(K\pi,\gamma)$ coincidence technique. The probable energy range of the γ rays to be observed is inferred from the results of Experiment 760 and is very much lower than previous theoretical estimates.

0 1 2m

*Experiment 782 - Spin-Spin Effects in Medium and High $P_{\perp}^2$ Elastic
 p-p Scattering*

University of Michigan	R.J. Bruni, G.R. Court, D.G. Crabb, R. Cummings, I. Gialas, W.A. Kaufman, F.Z. Khiari, A.D. Krisch, A.M.T. Lin, R.A. Phelps, R.R. Raylman, R.S. Raymond, T. Roser, J.A. Stewart, K.M. Terwilliger, [†] B.S. Van Guilder, B. Vuaridel
Brookhaven National Laboratory	K.A. Brown, G.T. Danby, Y.Y. Lee, L.G. Ratner
University of Maryland	D.C. Peaslee
Massachusetts Institute of Technology	P.R. Cameron
University of Notre Dame US Dept. of Energy	J.R. O'Fallon
Rice University	J.B. Roberts
Texas A&M University	T.S. Bhatia, G. Glass, L.C. Northcliff
ETH Zurich	M. Simonius
Spokesman:	A.D. Krisch

[†] Deceased.

The new, unique AGS polarized proton beam capability and our polarized proton target will be utilized to measure spin-spin effects in proton-proton elastic scattering. We will measure the elastic differential cross sections in pure initial spin states in a completely unexplored energy and momentum transfer region. The physics motivation is both the excitement of studying a totally unexplored area, and the further study of the large and dramatic high- $P_{\perp}^2$ spin-spin effect discovered at the ZGS. The ratio of the spin parallel to antiparallel p-p elastic cross section reach $\sigma_{\uparrow\uparrow}:\sigma_{\uparrow\downarrow} = 4$ at the maximum ZGS $P_{\perp}^2$ of 5.6 (GeV/c)^2 at 12.75 GeV/c. The ratio will be observed to see if it will continue to rise, to plateau, or to drop off as predicted by QCD quark interchange models. The unexpected ZGS results suggest that this proposed experiment should be very exciting.

Experiment 787 - A Study of the Decay $K^+ \rightarrow \pi^+ \nu \bar{\nu}$

Brookhaven
National
Laboratory

M.S. Atiya, I-H. Chiang, J.S. Frank, J.S. Haggerty, T.F. Kycia,
K.K. Li, L.S. Littenberg, A.K. Sambamurti, A.J. Stevens,
R.C. Strand

Los Alamos
National Laboratory

W.C. Louis

Princeton
University

D.S. Akerib, M.M. Ito, D.R. Marlow, P.D. Meyers, M.S. Selen,
F.C. Shoemaker, A.J.S. Smith

TRIUMF

E.W. Blackmore, D.A. Bryman, L. Felawka, P. Kitching,
A. Konaka, Y. Kuno, J.A. Macdonald, T. Numao, P. Padley,
J.-M. Poutissou, R. Poutissou, J. Roy, R. Soluk, A.S. Turcot

Spokesmen:

L.S. Littenberg, A.J.S. Smith, D.A. Bryman

This experiment proposes to search for $K^+ \rightarrow \pi^+ X^0 X^0$, where X^0 is any neutral, light and weakly interacting particle, with a sensitivity of 2×10^{-10} , three orders of magnitude beyond the limit in force at the outset of E787.

The decay $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ provides a sensitive test of the standard model of weak and electromagnetic interactions, a way of searching for new generations of quarks and leptons and constraints on the parameters of the present six quark model.

The decay $K^+ \rightarrow \pi^+ X^0$ is also an excellent place to search for evidence of a variety of neutral, light and weakly interacting particles, X^0 , such as axions, familons, and the supersymmetric photino, goldstino, and scalar higgs (shiggs) predicted by current theories.

788

Will Measure Γ^r , Γ^n , Γ^x to $\approx 14\%$.

τ to $\approx 10\%$.

$E(p)$ to $\approx 15\%$.

$E(n)$ to $\approx 10\% - 20\%$.

*Experiment 788 - The Four Fermion Weak Interaction and the Decay
of ${}^4_{\Lambda}\text{He}$ and ${}^5_{\Lambda}\text{He}$*

Carnegie-Mellon University	P. Barnes, G. Diebold, G. Franklin, R. Grace, D. Hertzog, C. Maher, R. McCrady, B. Quinn, J. Seydoux, J. Szymanski, X. Yi
Brookhaven National Laboratory	S. Bart, R. Chrien, P. Pile, R. Sutter
University of Houston	E.V. Hungerford, T. Kishimoto, L.G. Tang
University of New Mexico	B. Bassalleck
Vassar College	R. Stearns
Spokesmen:	P.D. Barnes and G. Franklin

This experiment proposes to study the four fermion weak interaction through investigation of the $\Lambda N \rightarrow NN$ interaction as manifested in the weak decay of hypernuclei. Using the $K^- + A \rightarrow \pi^- + {}_{\Lambda}A$ reaction to form ${}^4_{\Lambda}\text{He}$ and ${}^5_{\Lambda}\text{He}$, it is proposed to determine the life time and the four partial decay rates that characterize the weak decay. Because the Λ and the nucleons are all in relative s states, one can extract from the decay rates information on the elementary $\Lambda N \rightarrow NN$ spin-isospin amplitudes.

The ACS hypernuclear spectrometer at the separated kaon beam, LESBI, will be used to tag the formation of ${}^4_{\Lambda}\text{He}$ and ${}^5_{\Lambda}\text{He}$. The Carnegie-Mellon range and timing spectrometer will be used to measure the time spectrum and energy distribution of pion and proton decay products from the tagged events. Coincident neutrons will be detected in a time-of-flight neutron spectrometer. Previous data of this type is either non-existent or of very poor quality. The life time measurement will be based on the coincident proton spectrum with a system that has been demonstrated to be capable of $\sigma \approx 100$ ps prompt time resolution.

A plan view of the experimental apparatus. The beam defining elements are not shown.

Experiment 791 - A Study of Very Rare K_L Decays

University of California Irvine	C. Mathiazhagen, W.R. Molzon
University of California Los Angeles	R.D. Cousins, J. Konigsberg, J. Kubic, P. Melese, P. Rubin, W.E. Slater, D. Wagner
Los Alamos National Laboratory	G. Hart, W.W. Kinnison, D.M. Lee, R.J. McKee, E.C. Milner, G.H. Sanders, H.J. Ziock
University of Pennsylvania	K. Arisaka, P. Knibbe, J. Urheim
Stanford University	S. Axelrod, K. Biery, G. Irwin, K. Lang, J. Margulies, D. Ouimette, J. Ritchie, Q. Trang, S.G. Wojcicki
Temple University	L.B. Auerbach, P. Buchholz, V.L. Highland, W.K. McFarlane, M. Sivertz, C. Zhang
College of William and Mary	M. Chapman, M. Eckhouse, J. Ginkel, D. Joyce, J.R. Kane, C. Kenney, W.F. Vulcan, R.E. Welsch, R.J. Whyley, R.G. Winter
Spokesmen:	R.D. Cousins and W.R. Molzon

This experiment investigates rare K_L decays. The first priority is a search for the decay $K_L \rightarrow \mu e$ with a branching ratio sensitivity of 10^{-12} . A positive signal would be the first demonstration of the nonconservation of separate lepton number. The experimenters can also collect $10^3 - 10^4$ events from the decay $K_L \rightarrow \mu^+ \mu^-$. With such a sample the longitudinal polarizations of the positive muons can be measured with a precision of 10-20%. A nonzero value is indicative of a new CP violating interaction. There is presently no experimental information on the muon polarization in this decay. The experiment will search for the decay $K_L \rightarrow e^+ e^-$. Since the Standard Model predictions lie below the sensitivity of the experiment, a positive result would be another indication of new physics. The experiment also proposes to search for other rare decays: $K_L \rightarrow \pi^0 \mu e$, $K_L \rightarrow \mu \mu \gamma$, $K_L \rightarrow e e \mu \mu$, etc.

793

Cross section through target and detector stack. Thicknesses of CR-39 and Pb sheets are 0.06 cm and 0.5 cm respectively.

*Experiment 793 - Search for Fractionally Charged Nuclei in
15A GeV Sulfur-Oxygen Collisions*

University of
California-Berkeley

P.B. Price

Spokesman:

P.B. Price

Using a stack of CR-39 plastic track detectors, this experiment will look for fractionally charged projectile fragments produced in collisions of 15A GeV sulfur nuclei with lead targets. The expected charge resolution is $\sigma_Z = 0.06e$ for fragments with $19 e/3 \leq Z \leq 47 e/3$. Using similar equipment, an upper limit of $\sim 10^{-3}$ has been set on the fraction of projectile fragments with fractional charge in 2.1A GeV argon collisions with a plastic target at the LBL Bevalac. Theoretical considerations suggest that, if QCD is broken, quarks might become separated during a nucleus-nucleus collision and form quark-nucleus complexes if the CM energy is high enough. With its order-of-magnitude higher energy than the Bevalac, the Brookhaven heavy ion accelerator may permit this goal to be achieved.

Additional goals of the experiment are to measure the interaction mean free paths of projectile fragments, to look for forward-directed fragments with higher Z than the projectile, and to measure the dependence of detector response on Lorentz factor of the beam.

Experiment 794 -One-Spin Effects in $p + p \rightarrow p + p$ at High- $P_{\perp}^2$

University of Michigan	C.E. Arzt, P.R. Cameron, G.R. Court, D.G. Crabb, G. DeMuth, I. Gialas, W.A. Kaufman, F.Z. Khiari, A.D. Krisch, Y. Lepottier, A.M.T. Lin, R.A. Phelps, R.R. Raylman, R.S. Raymond, T. Roser, J.A. Stewart, K.M. Terwilliger, [†] B.S. Van Guilder, B. Vuaridel
Brookhaven National Laboratory	K.A. Brown, G.T. Danby, L.G. Ratner
University of Maryland	D.C. Peaslee
University of Notre Dame/US DOE	J.R. O'Fallon
Rice University	J.B. Roberts
Texas A&M University	T.S. Bhatia, G. Glass, L.C. Northcliff
TRIUMF	C.A. Miller, M.C. Vetterli
ETH, Zurich	M. Simonius
Spokesman:	A.D. Krisch

[†] Deceased.

The experimenters will scatter a high intensity unpolarized proton beam from a polarized proton target and measure the left-right asymmetry of Analyzing Power in proton-proton elastic scattering. The elastic differential cross-sections in different initial spin states in the large- $P_{\perp}^2$ region from 6.5 to 8 (GeV/c)² will be measured. The physics motivation is both the study of the totally unexplored area beyond $P_{\perp}^2 = 6.5$ (GeV/c)² and the improvement of the precision at 6.5 (GeV/c)² where recent AGS experiment E748 found a huge and unexpected value of A. The experiment will observe whether A continues to rise sharply in this previously unexplored hard-scattering region.

*Experiment 802 - Studies of Particle Production at Extreme Baryon Densities
 in Nuclear Collisions at the AGS*

Argonne Nat. Lab.	S. Kaufman
Brookhaven National Laboratory	D. Alburger, D. Beavis, P.D. Bond, C. Chasman, Z. Chen, Y.Y. Chu, J.B. Cummings, R. Debye, S. Gushue, O. Hansen, S. Katkoff, M.J. LeVine, Y. Miake, B. Moskowitz, J. Olness, L.P. Remsberg, M. Tanaka, M.J. Tannenbaum, J.H. van Dijk, F. Videbaek, P. Vincent, H. Wegner
Univ. of Buenos Aires	M. Mariscotti
Columbia University	I. Juricic, K. Kurita, S. Nagamiya, P. Stankus, O. Vossnack, Y. Wu, W. Zajc
Hiroshima University	T. Sugitate
Kyushu University	K. Kimura
Lawrence Berkeley Laboratory	H. Crawford J. Engelage
Massachusetts Institute of Technology	M. Bloomer, B. Cole, J. Costales, L. Grodzins, H. Huang, R.J. Ledoux, R. Morse, C. Parsons, M. Sarabura, S.G. Steadman, G. Stephans, V. Vutsadakis, D. Woodruff
University of Tokyo and INS	Y. Akiba, H. Hamagaki, R.S. Hayano, S. Hayashi, S. Homma, Y. Ikeda, H. Sakurai
University of California, Riverside	T. Abbott, S.Y. Fung, J. Kang
Spokesmen:	C. Chasman and S. Nagamiya

Experiment 802 uses beams of ^{28}Si and ^{16}O at a momentum of 14.5 (GeV/(cu)) and targets of Al, Cu, Ag, and Au. The setup consists of beam counters, event characterization detectors and a 25 msr magnetic spectrometer. The beam counters define the beam geometry, the charge of the projectile, a minimum bias trigger (change of charge by >2), and a time-of-flight start. A forward calorimeter measures the projectile residual energy. The event characterization is made with a ϕ -symmetric multiplicity array of proportional counters with segmentation 3300 and a neutral energy calorimeter of 245 pieces of lead glass with $\phi = \pi$ coverage. The spectrometer features tracking designed to a multiplicity of 20 for momentum determination, time-of-flight ($\Delta t = 75$ ps), and 2 threshold Cerenkov counters with segmentation 96 (aerogel) and 40 (gas), respectively, for particle identification. Data on semi-inclusive particle spectra have been measured with ^{28}Si and ^{16}O for the above targets. New goals concentrate on two-particle correlations.

Fig. 1. Schematic diagram of emulsion stack exposures.

Schematic diagram of the emulsion chamber exposures.

*Experiment 808 - Interactions of 14.1 GeV/amu Nuclei from ^{16}O to ^{197}Au
in Light and Heavy Targets*

Institute of Nuclear
Physics, Krakow

R. Holynski, A. Jurak, A. Olszewski, B. Wilczynska,
H. Wilczynski, W. Wolter

Louisiana State
University

L. Barbier, W.V. Jones, E. Pruet, J.P. Wefel, W. Wosiek

University of Minnesota

P.S. Freier, C.J. Waddington

Spokesman:

C.J. Waddington

Nuclear track emulsions will be used for investigating interactions of ^{16}O , ^{32}S and, when available, ^{108}Ag and ^{197}Au nuclei in light (plastic) and heavy (emulsion and lead) targets. Emphasis will be placed on the analysis of central collisions by selecting events exceeding a given threshold of target excitation, as defined by the number of low energy fragments emitted from the target nucleus.

Measurements in the emulsions will include (1) the charges and emission angles of the projectile fragments, (2) the number and emission angles of the produced charged particles, (3) the number and angular distributions of heavily ionizing particles emitted from the emulsion target nuclei, and, for a subset of the events (4), the number and energy of electron pairs in restricted angular regions. The data will permit studies of (1) projectile fragmentation modes, including transverse momentum distributions and possible dependences on the topology of the interactions, (2) the pseudo-rapidity distributions (including structure, correlations, etc.) of charged particles and the dependence of the multiplicity on the number of interacting nucleons, and (3) the possibility of enhanced production of direct photons/electrons in high density matter.

810

The three TPC modules shown in the MPS magnetic field have 12 rows of anode readout wires. Each row is spaced 3.8 cm apart and consists of 256 short anode wires 1 cm of length along the beam direction and with 2.54 mm spacing between wires. The wire number gives the X, Z coordinates and the drift time gives the Y coordinate for unambiguous 3-D point determination. Greater than 120 Si-on-Au track events have been pattern recognized with good efficiencies. Lambdas have been observed. The drift region in each of three modules is 60 cm high by 65 cm wide by 47 cm long. A time-of-flight wall (not shown) identifies anti-protons.

*Experiment 810 - A Search for Quark Matter (QGP) and Other New Phenomena
Utilizing Heavy Ion Collisions at the AGS*

Brookhaven National Laboratory	A. Etkin, K.J. Foley, R.W. Hackenburg, R.S. Longacre, W.A. Love, T.W. Morris, E.D. Platner, A.C. Saulys
City College of New York and BNL	S.J. Lindenbaum
City College of New York	C.S. Chan, M.A. Kramer
Johns Hopkins University	T. Hallman, L. Madansky
Rice University	D.L. Adams, S. Ahmad, B.E. Bonnier, J.A. Buchanan, C.N. Chiou, J.M. Clement, M.D. Corcoran, T. Empl, H.E. Miettinen, G.S. Mutchler, J.B. Roberts, J. Skeens
Spokesmen:	S.J. Lindenbaum and E.D. Platner

Heavy ion collisions will be studied at the AGS by measuring the angles and momenta of virtually all charged particles emitted in each event. Particle identification will be determined where possible.

The experimenters will look for anomalous behavior in rapidities (or pseudorapidities), multiplicity, strangeness enhancements, $P_{\perp}(E_{\perp})$, energy flow; possibly observe Hanbury-Brown and Twiss effects, deflagration (detonations), and other new phenomena. These observations will be on an event-by-event basis so that particularly interesting classes of events can be selected and added together to search for new effects implying a QGP or other new states of matter, in a manner which tends to maximize signal-to-background ratios.

Schematic of Apparatus

Experiment 813 - Search for a Strangeness -2 Dibaryon

Carnegie-Mellon University	M. Athanas, P.D. Barnes, G. Diebold, G. Franklin, C. Maher, B. Quinn, M. Rozon, R. Schumacher, I. Sukaton, I Zeps
University of Birmingham	J. Lowe, J. Nelson
Brookhaven National Laboratory	S. Bart, R. Chrien, P. Pile, R. Sutter
Freiburg University	P. Birien, J. Franz, N. Hamann, E. Rössle, H. Schmitt
University of Kyoto	K. Imai, A. Masaike, K. Miyake
Los Alamos National Laboratory	J. Szymanski
University of Manitoba	S. Page, D. Ramsay, W. van Oers
University of New Mexico	B. Bassalleck, D. Wolfe
CEN, Saclay	P. Birien
TRIUMF	D. Gill
Vassar College	R.L. Stearns
Spokesmen:	G. Franklin, P.D. Barnes

Motivated by Jaffe's 1977 prediction of a six-quark object with strangeness -2 and $J^\pi = 0^+$ at a mass of 2150, this experiment proposes to study the strangeness -2 two-baryon mass spectrum from 100 MeV below the mass of the lightest known two-baryon strangeness -2 system, $\Lambda\Lambda$ mass. This particle, called the "H", has been predicted by later bag models as well. Although the mass calculation is model dependent, the predictions are considered within the expected range of sensitivity. The possibility of resonances near the $\Lambda\Lambda$ mass due to conventional meson exchange forces can also be explored since the experiment covers the region both above and below the $\Lambda\Lambda$ mass.

Experiment 814 - Study of Extreme Peripheral Collisions and of the Transition from Peripheral to Central Collisions in Reactions Induced by Relativistic Heavy Ions

Brookhaven National Laboratory	M. Fatyga, R. Hogue, D. Lissauer, T. Ludlam, D. Makowiecki, E. O'Brien, V. Polychronakos, H. Takai, T. Throwe, C. Woody
CERN	W.J. Willis
Los Alamos Nat. Lab.	J. Boissevain, D. Fox, W. Sondheim, J. Sunier, H. van Hecke
McGill University	J. Barrette, S.K. Mark, C. Pruneau
University of New Mexico	B. Bassalleck, J. Hall, D. Wolfe
University of Pittsburgh	W. Cleland, K. Jayananda, D. Kraus, U. Sonnadara, M. Takagui, X. Zhang
State University of New York, Stony Brook	R. Bellwied, P. Braun-Munzinger, G. David, N. Herrmann, W. Llope, M. Muthuswami, J. Stachel, L. Waters, N. Xu, Y.C. Zhang
University of Tel-Aviv	R. Heifetz
Texas A&M University	J.A. Shoemaker, J. Simon, K. Wolf
Yale University (Nuclear Physics) (High Energy Physics)	S.V. Greene, T. Hemmick, J. Mitchell, B. Shivakumar R. Majka, F. Rotondo, J. Sandweiss
Spokesman:	P. Braun-Munzinger

Experiment 814 combines 4π calorimeter coverage with a high resolution forward spectrometer. Extreme peripheral collisions are investigated by making an exclusive study of projectile fragmentation processes induced by Coulomb excitation. Central collision, including transverse energy and charged particle multiplicity production and a search for hydrodynamic flow effects are also studied. In the forward spectrometer, spectra for protons, neutrons and eventually, pions and kaons are measured to provide a detailed picture of the stopping process. A search is made for neutral particles, possibly produced in central collisions. The possible production of strange matter in such collisions is studied. The target area calorimetry provides a reaction trigger while fragments are identified in the forward spectrometer by their momentum/charge, Time-Of-Flight, specific energy loss and kinetic energy. This includes a measurement of anti-proton production and a search for anti-nucleus production in such collisions.

815

*Experiment 815 - Study of Particle Production and Nuclear Fragments
in Collisions of Heavy Ion Beams with Emulsion Nuclei*

Lebedev Institute	M.I. Adamovich, Y.A. Alexandrov, M.M. Chernyavsky, S.G. Gerassimov, S.P. Kharlamov, V.G. Larionova, N.V. Maslennikova, G.I. Orlova, N.G. Peresadko, N.A. Salmanova, M.I. Tretyakova
Panjab University	M.M. Aggarwal, R. Arora, V.S. Bhatia, M. Kaur, I.S. Mittra
Tashkent Institute of Nuclear Physics	E. Basova, R.A. Bondarenko, U.G. Gulyamov, S.H. Nasyrov, N.V. Petrov, N. Saidkhanov, T.P. Trofimova
Jaipur University	K.B. Bhalla, A. Gill, V. Kumar, P. Lal, S. Lokanathan, S. Mookerjee, R. Raniwala, S. Raniwala, V.S. Shukla
Jammu University	A. Bhasin, S. Kachroo, G.L. Kaul, L.K. Mangotra, N.K. Rao
University of Washington	T.H. Burnett, J. Grote, J. Lord, D. Skelding, R.J. Wilkes
Hua-Zhong Normal U.	X. Cai, L.S. Liu, W.Y. Qian, H.Q. Wang, D.C. Zhou, J.C. Zhou
Physical-Technical Institute-Tashkent	L.P. Chernova, S.I. Gadzhieva, K.G. Gulamov, F.G. Kadyrov, N.S. Lukicheva, V.S. Navotny, L.N. Svechnikova
Phillips University	B. Dressel, E.R. Ganssauge, S. Hackel, H. Kallies, C. Mueller, J.T. Rhee, W. Schultz
Lawerence Berkeley Lab.	E.M. Friedlander, H.H. Heckman, P.J. Lindstrom
University of Lund	S. Garpman, I. Otterlund, S. Persson, K. Söderström, E. Stenlund
National Research Council of Canada	B. Judek, R.S. Storey
Shanxi Normal University	J.F. Sun, Z.O. Weng, D.H. Zhang
Academica Sinica	G.F. Xu, P.Y. Zheng
Spokesman:	I. Otterlund

This experiment measures, on an event-by-event basis, pseudorapidity density distributions, density fluctuations, multiplicity and angular distributions of nuclear fragments and recoiling protons (30-400 MeV) cross sections for production and interaction of light and medium ($Z = 2-8$) projectile fragments and the partial inelasticity for production of photons. The studies are performed in the energy range 13-200 A GeV. The detectors are emulsion chambers, as well as conventional emulsion stacks.

EXPERIMENTAL LAYOUT for E-817

Experiment 817 - Polarization Transfer in Hyperon Production

Rice University	D.L. Adams, S. Ahmad, B.E. Bonner, J.A. Buchanan, J.M. Clement, M.D. Corcoran, H.E. Miettinen, G.S. Mutchler, J.B. Roberts, J. Skeens, P.M. Stevenson
Brookhaven National Laboratory	S.U. Chung, H. Willutski
Johns Hopkins University	T. Hallman, L. Madansky
University of Minnesota	K.A. Johns
Spokesmen:	B.E. Bonner and J.B. Roberts

Since the discovery that inclusively produced hyperons are polarized, the underlying cause of the effect has remained a mystery. No perturbative QCD predictions are possible for the kinematic range covered by experiment, but simple parton-based theories that explain the effect in terms of breaking of strings or Thomas precession of strongly accelerated quarks have had a remarkable degree of success in explaining the effect. This experiment aims to measure the hyperon polarization when produced by a polarized proton beam. The question being addressed is how much the hyperon polarization is influenced by that of the proton. The experiment has been performed for the case of lambdas produced by polarized protons at 13 and 18 GeV/c. In rough agreement with the model, the lambda polarization is independent of that of the proton ($D_{NN} \approx 0$) and the left-right asymmetry for lambda production is also near zero. A first measurement of these quantities for Σ^0 production has shown large deviations from the predictions of the model. We expect to continue the Σ^0 experiment to be able to make a definitive test of an extended model which we have proposed.

Experiment 818 - Search for a J^{PC} - Exotic Hybrid Meson

Brookhaven National Laboratory	S.U. Chung, H. Kirk, S.D. Protopopescu
Indiana University	R. Crittenden, A. Dzierba, T. Marshall, D. Zieminska
Southeastern Massachusetts University	N. Bar-Yam, J. Dowd, W. Kern, E. King
Rice University	B.E. Bonner, G. Mutchler, J.B. Roberts
Spokesman:	S.U. Chung

The aim of this experiment is to look for a J^{PC} -exotic meson which cannot couple to a quarkonium. Such a state is expected as a hybrid meson composed of a $q\bar{q}$ in color octet - and a valence gluon. In particular, a hybrid meson with $J^{PC} = 1^{\pm}$ and $I = 1$ is supposed to decay into the channels $D(1285)\pi$ and $B(1235)\pi$.

Block Diagram for ^{11}C measurement.

*Experiment 819 - Electromagnetic Dissociation of ^{59}Co and ^{197}Au
by 15 GeV/Nucleon ^{16}O and ^{32}S*

Iowa State University J. C. Hill, J.A. Winger, F.K. Wohn

Spokesman: J.C. Hill

This experiment deals with electromagnetic effects in relativistic heavy ion (RHI) reactions. Electromagnetic dissociation (ED) is a purely electromagnetic process occurring in RHI reactions in which the Coulomb field of one of the participants excites a collective oscillation (generally E1 giant resonance) in the other. The most likely decay mode for the resonance for heavy nuclei is by one-neutron emission. Measurements at the Bevalac showed that the ED process on Au targets produces a large effect for ^{56}Fe and ^{139}La projectiles at relativistic energies. Calculations indicate that the ED cross section should grow dramatically for heavier projectiles and higher energies, becoming much larger than the total cross section from all nuclear processes at energies envisioned for the RHIC collider. Experimental information is only now becoming available on the energy dependence of the ED process.

Experiments at the AGS at 15 GeV/nucleon and at CERN at 60 and 200 GeV/nucleon presented a unique opportunity to test ED at energies comparable to those envisioned for the next generation of RHI colliders where ED effects are expected to dominate the reaction process. Experiments have been carried out at the AGS in which ^{59}Co and ^{197}Au targets were bombarded with ^{16}O and ^{28}Si ions. For each target species three foils of successively greater thickness were irradiated simultaneously in order to correct for contributions due to secondary reactions. Initial counts on the foils at Iowa State University clearly showed the one neutron out products. A precise cross section for the $^{12}\text{C}(^{28}\text{Si},\text{X})^{11}\text{C}$ reaction using the AGS ^{28}Si beam has been measured to be 73.5 ± 3.5 mb. It will be used to establish absolute beam intensities for our AGS experiments. After the data from the AGS and CERN are analyzed, the picture of the energy dependence of the ED process at ultrarelativistic energies will become clearer.

The spectrometer and counter set-up of E820. Top part of the figure shows a schematic diagram of the missing mass spectrometer while the bottom part shows the liquid ^3He target and scintillation counters' arrangement.

*Experiment 820 - Search for $S = -1$ Dibaryon Resonance in the Mass Region
 (2.05-2.15) GeV/c² Using the Reaction $^3\text{He}(K^-, \pi^+)nX$*

Florida State University	H. Piekarz
Brookhaven National Laboratory	S. Bart, R.E. Chrien, P.H. Pile, N. Tsoupas, T. Ward
Institute for Nuclear Studies (Tokyo)	T. Fukuda
Massachusetts Inst. of Technology	M. Deutsch
Ohio State University	K. Hicks
Osaka University	T. Kishimoto
Texas A&M University	R. Krauss
TRIUMF	D. Gill
University of Houston	E. Hungerford, K. Johnston, B. Mayes, L. Tang
Vassar College	R. Stearns
Spokesman:	H. Piekarz

Experiment 820, which ran for about 600 hours during the 1988/89 AGS slow extraction period is a search for the "bag model" predicted strangeness -1 dibaryon resonance of about 2.1 GeV/c² mass, spin 0 and orbital-parity LP = -1 using the reaction of K⁻ mesons with ³He target nuclei. This reaction was studied using the two-arm magnetic spectrometer at the LESBII beam line. The kaon beam momentum was chosen at 870 MeV/c and the scattering angle 20°. This high scattering angle enhanced the production of the p-wave resonances. The liquid ³He target located between the two arms of the spectrometer was surrounded by the scintillation hodoscopes to provide the Δ -particle trigger as well as to reduce the kaon-in-flight decay background. The missing mass spectrum from the examined reaction was measured for about 4*E10 K⁻ mesons.

*Experiment 821 - A New Precision Measurement of the muon g-2 Value
at the Level of 0.35 PPM*

Boston University	D.H. Brown, E. Hazen, B. Kerosky, F. Krienen, D. Loomba, W. Meng, J.P. Miller, B.L. Roberts, L.R. Sulak, W. Worstell
Brookhaven National Laboratory	H.N. Brown, G. Bunce, J.R. Cullen, Jr., G.T. Danby, J.W. Jackson, M. May, W. Morse, A. Prodell, R. Shutt, P.A. Thompson, K. Woodle
Case Western Reserve	W.J. Fickinger, D.K. Robinson
City College of New York	K. Becker, M.S. Lubell
Cornell University	T. Kinoshita, Y. Orlov
Fairfield University	D. Winn
University of Heidelberg	K. Jungmann, P. von Walter, G. Zu Putlitz
Los Alamos National Laboratory	E. Knapp, W.P. Lysenko
University of Tokyo	K. Nagamine, K. Nishiyama
National Laboratory for High Energy Physics (KEK)	K. Endo, H. Hirabayashi, S. Ichii, S. Kurokawa, K. Mashata, Y. Mizumachi, S. Sakamoto, T. Sata, A. Yamamoto
University of Riken	K. Ishida
Institute for Nuclear Physics, Novosibirsk	L.M. Barkov, D.N. Grigoriev, B.I. Khazin, E.A. Kuraev, S.I. Redin, Ya. M. Shatunov, E. Solodov
Yale University	P. Cushman, S.K. Dhawan, F.J.M. Farley, X. Fei, V.W. Hughes
Spokesman:	V.W. Hughes and B.L. Roberts

The primary aim of this experiment is to measure the electroweak radiation correction to muon g-2 and test the renormalizability of the standard theory. It will go beyond that goal and produce information on physics above 1 TeV by extending the search for lepton substructure and testing speculative new theories, such as supersymmetry. The measurement of g-2 value of the muon to a precision of 0.35 ppm would represent an improvement by a factor of 20 over the CERN muon storage ring experiment.

Figure 1. The fraction of target fragments recoiling forward (F) to those recoiling backward (B) for 232 GeV $^{16}\text{O} + ^{197}\text{Au}$.

Figure 2. (a) Energy dependence of F/B ratio for ^{24}Na produced in the reaction of protons and heavy ions with Cu.
(b) Same as (a) except the target nucleus is Au.

Experiment 825 - Radiochemical Studies of Ultrarelativistic Nuclear Collisions

Oregon State University	C. Casey, W. Loveland, Z. Xu
Brookhaven National Laboratory	Y.Y. Chu, J.B. Cumming, P.E. Haustein, S. Katcoff
Purdue University	M. Bronikowski, Y.H. Chung, N.T. Porile
Studsvik Science Research Laboratory	K. Aleklett, L. Sihver
Spokesman:	W. Loveland

This experiment extended previous studies of target fragmentation to ultrarelativistic nucleus-nucleus collisions by measuring the target fragment yields and recoil properties for the interaction of 15A GeV ^{16}O and ^{28}Si with V, Cu, Ag, and Au. It has been found that multifragmentation products from the interaction of 232 GeV ^{16}O with ^{197}Au are emitted preferentially backwards in the laboratory system ("backsplash") with $F/B = 0.81 \pm 0.05$. This effect is not seen for similar products from V, Cu or Ag targets or from Au fission or deep spallation products. A manuscript describing the results of this experiment has been published (Phys. Rev. C37, 1311 (1988)).

*Experiment 826 - Exclusive Experiment of High Energy Nuclear Reactions
Induced by ^{32}S Ions with 15 GeV/N at BNL AGS*

Saga University	H. Itoh
Tohoku University	M. Chida, T. Hayasino, Y. Yamato
Nagoya University	K. Nakazawa
Osaka University	R. Ihara, T. Nakai
Sagami Institute of Technology	H. Sugimoto, K. Taira
Gifu University	S. Tasaka
Utsunomiya University	Y. Sato
Kanagawa University	N. Tateyama
Spokesman:	H. Itoh

Nuclear interactions induced by ^{32}S ions with 15 A GeV accelerated at the AGS will be studied in order to reveal the new phenomena of nuclear matter (quark gluon plasma, hydrodynamical motion of multi-nucleon system, etc.) by exclusive analysis of high energy nuclear collisions.

$$\frac{d\sigma}{2\pi d\cos\theta_p dT_p} \left[\frac{\mu b}{\text{sr MeV}} \right]$$

Calculated cross sections for the reaction $\pi^+ + {}^{16}\text{O} \rightarrow p + X$. Shaded peak corresponds to the formation of the η -mesic nucleus ${}^{150}_0^n$. Solid curve represents the background events due to the $(\pi^+, \pi p)$ process.

Beam: C2
Status: Complete in 1987
Approved Hours: 120

Experiment 828 - Search for η -Mesic Nuclei with the (π^+, p) Reaction at 0.85 GeV/c

Los Alamos National Laboratory	B.J. Dropesky, R.J. Estep, G.C. Giesler, L.C. Liu
College of William and Mary	M. Finn, H. Funsten, C.F. Perdrisat
Brookhaven National Laboratory	S. Bart, R.E. Chrien, P.H. Pile, R.J. Sutter, T.E. Ward
George Mason University	B.J. Lieb
Rutgers University	R.D. Ransome
University of Houston	T. Kishimoto
Vassar College	R.L. Stearns
Virginia State University	C.E. Stronach
Spokesmen:	L.C. Liu, H.O. Funsten, R.E. Chrien

This experiment proposes to verify a recent theoretical prediction of the possible existence of strongly bound systems of the η -meson and nuclei: the η -mesic nuclei. This prediction is based on two facts: (1) recent analysis of threshold $\pi^- p \rightarrow \eta n$ production indicates that the η -nucleon interaction is attractive at low energies; and (2) because of quantum mechanical effects, a nucleus with sufficient size can cause this attraction to develop strongly bound states that cannot exist between an η -meson and a free nucleon.

Experiment 829 - Search for an $S = -1$ Three-Body Bound System

University of Houston	E.V. Hungerford, T. Kishimoto, B. Mayes, L. Pinsky
Brandeis University	H. Piekarz
Brookhaven National Laboratory	S. Bart, R.E. Chrien, P.H. Pile, R.J. Sutter, T.E. Ward
Massachusetts Institute of Technology	M. Deutsch
Osaka University	T. Fukuda, T. Shibata
University of Texas	M. Barlett, G.W. Hoffman
Vassar College	R.L. Stearns
Spokesman:	T. Kishimoto

The search for $pp\Lambda$ and $nn\Lambda$ bound systems by using the $(K^-, \pi^\pm)$ reaction on a ^3He target is proposed. Experimentation has confirmed there is no bound state in the $S = -1$ two-body system. The lightest strange bound system experimentally known is $^3_\Lambda\text{He}$ which has very small binding energy. Preliminary considerations predict a slightly unbound $pp\Lambda$ or $nn\Lambda$ system; this cannot be taken as conclusive because of the large uncertainties of the three-body force. Experimental confirmation is desirable.

Beam: A1
Status: In progress
Approved Hours: 4

*Experiment 831 - Search for the Hypernuclear Projectile Fragments
in the Relativistic Heavy-Ion Collision Using an Emulsion Chamber*

University of Tokyo C. Nagoshi, K. Omata, Y. Shida
INS

Kobe University H. Fukushima, H. Fukushima, T. Hara, M. Miyagaki,
K. Taruma, C. Yokoyama

Brookhaven D. Beavis
National Laboratory

Spokesman: Y. Shida

The experimenters propose to search for hypernuclear projectile fragments in the collision induced by $A^* \text{ GeV/c}$ and $14 A^* \text{ GeV}$ heavy ions. The production cross section of the hypernuclear fragment will provide information on the possibility of a secondary hyperbeam. If the ratio of the hyperfragments to normal one ($= R$) is large, the lives and other properties of the hypernuclei can be studied. R is expected to increase more than an order of magnitude at $6 A^* \text{ GeV/c}$ due to increased hyperon production, and because of better kinematical matching in the formation probability of hyperfragments. In addition, secondary hyperon production processes such as the K, π reaction should contribute to the production of the hypernuclear fragments. The beam energy will be varied to see if the yield saturates at high incident energy.

Beam: C8
Status: Complete in 1990
Approved Hours: 430
(400 hours tentative)

*Experiment 835 - Kaon-Nucleus Total Cross Section Measurements
and Partial Deconfinement in Nuclei*

Tel-Aviv University J. Alster, D. Ashery, J. Lichtenstadt, M.A. Moinester, I. Navon,
E. Piasetzky, A. Rahav, I. Yavin

Brookhaven National S. Bart, R.E. Chrien, M. May, P.H. Pile, R.J. Sutter
Laboratory

Spokesmen: E. Piasetzky and R.E. Chrien

The classical view of nuclear physics is that nucleons in nuclei have the same properties as free nucleons. This approach has had substantial success; however, recent data, as well as some problems in low energy nuclear physics have led to a suggestion that the size of the nucleon increases inside the nucleus, as a consequence of a change in quark-deconfinement scale. It is important to test the hypothesis in a different momentum regime and with a different probe. A measurement of the ratio of K^+ -nucleus to K^+ -deuteron total cross section is proposed. This ratio is predicted to be sensitive to the proposed change in the radius of the nucleon in the nucleus.

Experiment 836 - Search for a Strangeness - 2 Dibaryon Using a ^3He Target

University of Birmingham	J. Lowe, J. Nelson
Brookhaven National Laboratory	S. Bart, R. Chrien, P. Pile, R. Sutter
Carnegie-Mellon University	M. Athanas, P.D. Barnes, G. Diebold, G. Franklin, C. Maher, B. Quinn, M. Rozon, R. Schumacher, I. Sukaton, V. Zeps
Freiburg University	P. Birien, J. Franz, N. Hamann, E. Rössle, H. Schmitt
University of Kyoto	K. Imai, A. Masaïke, K. Miyake
Kyoto Sangyo University	F. Takeutchi
Los Alamos National Laboratory	J. Szymanski
University of Manitoba	S. Page, D. Ramsay, W. van Oers
University of New Mexico	B. Bassalleck, D. Wolfe
CEN, Saclay	P. Birien
TRIUMF	D. Gill
Vassar College	R.L. Stearns
Spokesmen:	G.B. Franklin and P.D. Barnes

The two component target, used in the $\Xi^-, d)_{\text{atom}} \text{H}$ search of Exp. 813 will be replaced with a single ^3He target used in the reaction $\text{K}^- + ^3\text{He} \rightarrow \text{K}^+ + \text{H} + \text{n}$. With the ^3He target, greater sensitivity to a more tightly bound H is achieved. The ^3He target is to be considered a logical addition to the two component target measurement to extend the region of sensitivity to greater values of binding energy.

Gluon
Exchange

Quark
Interchange

Annihilation/
Creation

Quark Interch./
Annihilation

Plan view of the detector: BH and H1-H4 are scintillation-counter hodoscopes; PWC and DWC refer to proportional and drift wire chambers; and C1 and C2 are threshold gas Cherenkov counters for pions and kaons, respectively. The spectrometer magnet bent positive particles down and defined a narrow range of production angles about 22° in the laboratory. (28.4° for 6 GeV.)

Experiment 838 - 90° Exclusives at 6 GeV

Brookhaven National Laboratory	R. Appel, D.S. Barton, G. Bunce, A.S. Carroll, M. Kmit, D. Lowenstein, Y.I. Makdisi
University of Minnesota	H. Courant, G. Fang, K.J. Heller, K. Johns, M.L. Marshak, M.A. Shupe, C. White
Southeastern Massachusetts University	J.J. Russell
Pennsylvania State University	S. Heppelmann
Spokesmen:	G. Bunce and J.J. Russell

This experiment proposes to measure or set more stringent limits on the 13 exclusive reactions at 90° CM which were studied at 10 GeV, taking advantage of the higher cross sections at 6 GeV. A factor of 3 smaller momentum bite than was used at 10 GeV will be used, improving the missing mass resolution.

839

Non-Accelerator
Status: Complete in 1989
Approved Hours:

Experiment 839 - A Search for Magnetic Monopoles

Brookhaven
National Laboratory

A. Prodell

IBM

S. Bermon, P. Chaudhari, C.C. Chi, M.W. McElfresh, J.R. Rozen,
C.C. Tsuei

Spokesmen:

S. Bermon/A. Prodell

This project is a joint study involving the design, construction and operation of a prototype monopole detection system. The goal is to develop a large area prototype detector which can be replicated to achieve monopole flux limits approaching the Parker limit.

Exp. 840 anticipated sensitivity to ellipticity and rotation
as a probe of axion mass and coupling constant.

Non-Accelerator
Status: In progress
Approved Hours:

*Experiment 840 - Search for the Coherent Production of
Light Scalar and Pseudoscalar Particles*

University of Rochester	R. Cameron, G. Cantatore, A.C. Melissinos, Y.K. Semertzidis
Brookhaven National Laboratory	H. Halama, D.M. Lazarus, A.G. Prodell
Fermilab	F.A. Nezrick
CERN, Trieste	C. Rizzo, E. Zavattini
Spokesman:	A.C. Melissinos

The search for the existence of light scalar or pseudoscalar particles that couple to the electromagnetic field as suggested in several theoretical models is the purpose of this experiment. A polarized laser beam traverses in vacuum a strong magnetic field and the optical rotation with a sensitivity of order 10^{-12} rad is observed. This corresponds to a limit on the coupling $g_{a\gamma\gamma} > 10^{-8} \text{ GeV}^{-1}$. Two CBA dipoles with cold bore are used, and, to increase the path length, multiple reflections in an optical cavity are used. This experiment also expects to be able to measure for the first time the birefringence of the vacuum due to QED magnetic Delbrück scattering.

SCALE

 2 METERS

*Experiment 842 - Measurement of the Analyzing Power in pp Elastic Scattering
at 22 GeV/c and High Momentum Transfer*

Brookhaven National Laboratory	R. Appel, D.S. Barton, G. Bunce, A.S. Carroll, S. Gushue, D.I. Lowenstein, Y.I. Makdisi
University of Minnesota	H. Courant, K. Heller, M. Marshak, S. Saroff, M. Shupe, C. White
Pennsylvania State University	S. Heppelmann
Southeastern Massachusetts University	J.J. Russell
Spokesmen:	M. Shupe and Y. Makdisi

Measurement of the left-right asymmetry of vertically polarized protons scattered from a hydrogen target at $P(t)^2$ near 8 (GeV/c)^2 .

Energy dependence of the F/B ratio determined by thick-target thick-catcher measurements for Na-24 produced in the reactions of protons and heavy ions (C, O, Ne) with Au.

*Experiment 844 - Measurement of Angular Distributions for Fragments
in the Target Rapidity Region*

Brookhaven National
Laboratory

Y.Y. Chu, J.B. Cumming, P.E. Haustein, S. Katcoff,
R.W. Stoenner

Oregon State
University

W. Loveland

Spokesman:

J.B. Cumming

Angular distributions for typical light (Ar-37) and heavy (Xe-127) fragments formed by the interaction of 14.5 GeV/nucleon 0-16 with thin gold targets will be measured. Impetus for this is the observation from AGS Exp. 825 that products in the mass range 24-48 resulting from the multifragmentation of Au^{197} by 232 GeV 0-16 are emitted preferentially backwards in the laboratory system. Such enhanced "backsplash" was unexpected on the basis of existing studies of p-nucleus collisions up to 400 GeV or of nucleus-nucleus interactions up to ~ 25 GeV.

* To run when high intensity ^{16}O beam becomes available.

Experiment 845 - A Search for the Rare Decay $K^0 \rightarrow \pi^0 e^+ e^-$

Brookhaven National Laboratory	R.K. Adair, E. Jastrzembski, R.C. Larsen, L.B. Leipuner, W.M. Morse
Yale University	H. Greenlee, H. Kasha, E. Mannelli, K. Ohl, M.P. Schmidt M. Vagins
Vassar College	C. Schwarz
Spokesmen:	W.M. Morse/M.P. Schmidt

This is the first experiment to be optimized for the decay $K_L^0 \rightarrow \pi^0 e^+ e^-$. The detector has large acceptance for $K_L \rightarrow \pi^0 e^+ e^-$ and very good background rejection. The decay $K_L^0 \rightarrow \pi^0 e^+ e^-$ is sensitive to new physics beyond the standard model and to direct CP violation in the standard model. A single event sensitivity of 2.4×10^{-9} was achieved; about an order of magnitude better than previously published searches. Over one thousand $K_L^0 \rightarrow e^+ e^- \gamma$ and several $K_L^0 \rightarrow e^+ e^- e^+ e^-$ events were observed. Only four of the former decays had been observed in previously published searches. The limit on the latter decay mode was $B(K_L^0 \rightarrow e^+ e^- e^+ e^-) < 2.6 \times 10^{-6}$; about two orders of magnitude above the expected rate.

Experiment 847 - Study of Particles Production in Heavy-Ion Collisions

State University of
New York at Buffalo

P.L. Jain, K. Sengupta, G. Singh

Spokesman:

P.L. Jain

Nuclear emulsions will be used to study nuclear collisions of ^{16}O , ^{28}Si , ^{179}Au , and ^{32}S and other heavy ion beams (higher masses and energies). The experiment will measure in nuclear emulsion on an event-by-event basis, multiplicity-pseudorapidity density and density fluctuations of charged particles, charge multiplicity and angular distribution of projectile fragments and heavily ionizing particles emitted from the target fragmentation. Special emphasis will be placed on the analysis of events produced in the central collisions which are selected on the basis of low energy fragments emitted from the target excitation.

TOP VIEW SIDE VIEW

Beam:
Status:
Approved Hours: 200

Experiment 849 - Search for Muonium to Antimuonium Conversion

AT&T Bell Laboratories

Spokesman: D.R. Harshman and A.P. Mills, Jr.

This experiment proposes to search for the spontaneous conversion of muonium (M) to antimuonium ($\bar{M}$) in vacuum, by looking for the spectator orbital positron remaining after the decay of the μ^- . Important constraints will be placed on certain supersymmetric theories that allow the violation of lepton number conservation.

*EVA, A Solenoidal Detector for Large Angle Exclusive Reactions
 Experiment 850 - Determining Color Transparency to 22 GeV/c*

Brookhaven National Laboratory	R. Appel, D.S. Barton, G. Bunce, A.S. Carroll, S. Gushue, M. Kmit, D.I. Lowenstein, Y.I. Makdisi
University of Michigan	C. Rivers, G. Snow
University of Minnesota	H. Courant, K.J. Heller, K. Johns, M.L. Marshak, C. White
Mt. Holyoke College	H. Nicholson
Pennsylvania State University	S. Durant, S. Heppelmann, E. Minor, J.Y. Wu
Southeastern Massachusetts University	F. Barbosa and J.J. Russell
Tel-Aviv University	J. Alster, I. Mardor, Y. Mardor, E. Piasetzky
Spokesmen:	A.S. Carroll and S. Heppelmann

In order to extend the range and sensitivity of measurements of large angle exclusives scattering, a solenoidal detector, EVA, will be build. This new detector will increase the solid angle acceptance by a factor of 20 over the existing dipole detector and provide for 1% momentum measurements of outgoing 10 GeV/c particles. The initial experiment, 850, will allow the determination of nuclear transparency up to 22 GeV/c incident proton momentum. The additional momentum constraint derived from the measurement of both outgoing protons will produce a much improved signal to noise ratio. At 6 GeV/c, the missing energy will be ~ 50 MeV, allowing a partial separation of nuclear states. The solenoidal configuration provides an excellent geometry for studying a wide variety of two-body exclusive reactions near 90° in the center of mass. For example, reactions involving the two-body decays of neutral particles

will be very interesting.

Beam: D6
Status: Complete in 1989
Approved Hours: 2000

Experiment 851 - Proposal to Study the Decay $K^+ \rightarrow \pi^+ e^+ e^-$

Brookhaven National Laboratory	H.A. Gordon, D.M. Lazarus, H. Ma, P. Rehak
Paul Scherrer Institute (SIN)	J. Egger, W.D. Herold, H. Kaspar
University of Washington	V. Chaloupka, H.J. Lubatti, A. Shukla, T. Zhao
Yale University	C. Alliegro, A. Deshpande, N.J. Hadley, A.M. Lee, M.E. Zeller
Spokesman:	M.E. Zeller

The objective of this experiment is to search for $e^+ e^-$ states in the invariant mass range 1.02 MeV/c² to 350 MeV/c²; to observe the decay $\pi^0 \rightarrow e^+ e^-$; and to study the Dalitz plot distribution and improve the branching ratio measurement of the decay $K^+ \rightarrow \pi^+ e^+ e^-$.

E852

Experiment 852 - Search for Mesons with Unusual Quantum Numbers

Brookhaven National Laboratory	S.U. Chung, D. Weygand, H.J. Willutzki
Indiana University	B.B. Brabson, R.R. Crittenden, A.R. Dzierba, T.O. Foxford, R. Lindenbusch, C. Murphy, T. Sulanke, P.T. Smith, D. Zieminska
University of Louisville	C.L. Davis
Southeastern Massachusetts University	Z. Bar-Yam, J. Dowd, W. Kern
University of Notre Dame	B. Baumbaugh, J.M. Bishop, N.M. Cason, J. LoSecco, J. Manak, R.C. Ruchti, W.D. Shephard, S. Taeger
University of Washington	T. Burnett
Moscow State University	V. Bodyagin, L. Bravina, A. Demianov, A. Gribushin, N. Kruglov, A. Ostrividov, A. Proskuryakov, L. Sarycheva, N. Sinyov
Spokesmen:	S.U. Chung and A.R. Dzierba

Despite a number of experimental searches there is still no unambiguous candidate for a glueball, hybrid or four-quark state, although QCD predicts such objects. However, there are some tantalizing states, among them the M^0 (1405) which has exotic $J^{PC} = 1^{-+}$ and the scalar $G(1590)$ which has unusual branching ratios for a quark-antiquark state.

In Experiment 852, we will study these and other states, concentrating on decay modes of mesons with multi-photons and 0, 1 or 2 charged particles. The detector is built around the MPS. The target will be surrounded by a CsI veto, charged particle detectors and will be instrumented to locate interaction vertices by the detection of Cerenkov light. The target will be followed by charged particle detectors, a Cerenkov counter and a 3000-element lead glass calorimeter to detect photons from meson decays.

Plan view of experimental setup.

Experiment 854 - Antiproton-Nucleus Interactions at 5-10 GeV/c

Rice University	D.L. Adams, S. Ahmad, B.E. Bonner, J.A. Buchanan, C-N. Chiou, J.M. Clement, M.D. Corcoran, T. Empl, H.E. Miettinen, G.S. Mutchler, J. Skeens, J.B. Roberts
Los Alamos National Laboratory	W.R. Gibbs
Brookhaven National Laboratory	S.E. Eiseman, A. Etkin, K.J. Foley, R.W. Hackenburg, R.S. Longacre, W.A. Love, T.W. Morris, E.D. Platner, A.C. Saulys
BNL and City College of New York	S.J. Lindenbaum
Johns Hopkins University	T.J. Hallman, L. Madansky
University of Maryland	D.C. Peaslee
Spokesman:	B.E. Bonner

The behavior of hadronic matter at high energy densities is presently a subject of intense interest. In particular, lattice QCD calculations suggest that sufficiently hot hadronic matter will undergo a phase transition to a color-deconfined state: the so-called quark gluon plasma. Experimental efforts have employed collisions of heavy ions which have been restricted by the energies of the available heavy ion beams to studies of the low temperature-high density region of the nuclear matter phase diagram. This experiment proposes to study the high-temperature, low-density region of the nuclear matter phase diagram by means of antiproton annihilations in nuclei. Detailed intranuclear cascade calculations indicate that an energy density beyond that where interesting effects are predicted will be achieved in a substantial fraction of the collisions.

*Experiment 855 - Proposal to Study Low Energy Photon Production
in Proton Nucleus Collisions at the AGS*

Brookhaven National Laboratory	D. Lissauer, T. Ludlam, C. Woody
Oak Ridge National Laboratory	J. Beene, F. Bertrand, G. del Campo, A. Ray, D. Shapira, M. Tincknell
CERN	J. Schukraft, W. Willis
Spokesmen:	C. Woody and D. Shapira

A systematic study of low energy photon production in proton-nucleus collisions will be made and the observed signal with the associated event topology will be correlated. This study will measure photon production down to very low P_t ($\sim$ few MeV/c) and look for new sources of "soft" photons in excess of those produced by nuclear decays and hadronic bremsstrahlung. Experiment 814 will be used as the host experiment and provide information on energy flow in order to study event correlations.

Experiment 856 - Exploration of the Biomedical Potential of Antiprotons

Brookhaven National Laboratory	S. Bart, G. Bennett, R. Chrien, M. Sakitt, R. Sawafter, R. Sutter
Case Western Reserve University	W. Fickinger, D.K. Robinson
Harvard Cyclotron Laboratory	A. Koehler
Loma Linda University	J. Archambeau
University of Massachusetts	A. B. Brill
Syracuse University	D. Bridges, L. Gray, T. Kalogeropoulos, J. Reed, Z. Sobolewski
SUNY Health Science Center	D. Bassano, S. Manglos, S.C. Prasad
Spokesman:	T. Kalogeropoulos

The potential of antiprotons for practical applications within present production and collection capabilities has been examined and found to be promising for biomedical and industrial applications. It is in principle possible to store and transport sufficient quantities of antiprotons to satisfy the needs of these applications. These applications are based on the mass, annihilation, negative charge, and stability of the antiproton in vacuum. Applications include imaging of (a) electron density and (b) of elements, precise determinations of radiation delivery of heavy ion beams, and optimal radiation delivery to tumors.

This research effort will initiate exploration of the antiproton practical applications, starting with imaging. Images will be made of phantoms and will be compared with corresponding CT images.

857

Experiment 857 - π^0 Pair Production Near Threshold and Chiral Symmetry Breaking

University of Birmingham	J. Lowe
Oxford University	N.W. Tanner
Boston University	J.P. Miller, B.L. Roberts
University of British Columbia	M.D. Hasinoff, A.J. Noble, M. Sevier, C.E. Waltham
Brookhaven National Laboratory	M. Sakitt
Case Western Reserve University	W.J. Fickinger, D.K. Robinson
Central Research Institute for Physics, Budapest and TRIUMF	D. Horvath
University of New Mexico	B. Bassalleck, J.R. Hall, K.D. Larson, D.M. Wolfe
Spokesmen:	J. Lowe and B.L. Roberts

The cross section for the reaction $\pi^- + p \rightarrow \pi^0 + \pi^0 + n$ in the threshold region is sensitive to the chiral symmetry breaking parameter ξ , and when combined with data on the charged pion reactions

$$\begin{aligned}\pi^- p &\rightarrow \pi^+ \pi^- n \\ \pi^+ p &\rightarrow \pi^+ \pi^0 p\end{aligned}$$

will provide a good measurement of the chiral symmetry breaking parameter ξ . In addition, this experiment can search for the $\pi\pi$ resonance recently reported by the OMICRON collaboration, but in the neutral two π^0 channel.

The crystal box (see figure) is a 396-element NaI array, which was installed on the C8 line for Exp. 811. It is an effective π^0 detector, and is well suited to detection of the $\pi^0\pi^0$ final state with good acceptance. During April and May 1989 measurements were made between threshold ($P_\pi = 265$ MeV/c) up to 400 MeV/c, particularly in the region just above threshold where the cross section varies rapidly. Analysis of the data is just starting at the University of New Mexico.

Λ1 and Λ3 lines, magnet, dipole

*Experiment 858 - Measurement of Negative Particle Yield at 0° for 15A GeV
 Si + Au Collisions*

University of California Space Sciences Laboratory	H.J. Crawford, J. Engelage
Boston University	J. Beatty, B. Zhou
Brookhaven National Laboratory	D. Beavis, R. Debbe
University of California at Los Angeles	J. Carroll
National Laboratory for High Energy Physics (KEK)	J. Chiba, K. Tanaka
University of Waseda	T. Doke, T. Kashiwagi, J. Kikuchi
University of Tokyo	M. Aoko, R. Hayano, Y. Shimazu
John Hopkins University	T. Hallman
Louisiana State University	P. Kirk, L. Mao, Z. Wang
Lawrence Berkeley Laboratory	H.H. Heckman, P.J. Lindstrom
Columbia University	S. Nagamiya, P. Stankus
Spokesman:	H.J. Crawford

There is a broad range of uncertainty in the yield of anti-nuclei expected from high energy nucleus-nucleus collisions; production and survival are very sensitive to the details of the interaction region and the process of hadronization, making them a useful tool for probing this complex environment. E858 will measure the yield of p^- 's and $\bar{d}$'s at 0° using an AGS secondary beam line to see if the yield of complex anti-nuclei is likely to be sufficient to allow a detailed study of their formation. π^- and K^- yields at 0° will also be measured for a variety of secondary rigidities between 2 and 7 GV to complement the existing measurements at larger angle and $P_\perp$. The experiment will have a sensitivity of $\leq 10^{-7} d\sigma^3/dp^3(\pi)$ for finding new particles produced in this rigidity range. This short experiments will determine the feasibility of a larger program aimed at characterizing rare negative particle production in heavy ion collisions.

Figure 1: A plan view of the present E802 apparatus.

Experiment 859 - Studies of High-Density Baryon Matter from Extended Measurements of Particle Momentum Distributions and from High-Precision Two-Particle Correlations

Argonne National Laboratory	S. Kaufman, F. Videbaek
Brookhaven National Laboratory	D. Beavis, C. Chasman, Z. Chen, Y.Y. Chu, J.B. Cumming, R. Debye, S. Gushue, O. Hansen, M.J. LeVine, Y. Miake, B. Moskowitz, J. Olness, L.P. Remsberg
Columbia University	I. Juricic, K. Kurita, S. Nagamiya, P. Stankus, O. Vossnack, Y. Wu, W.A. Zajc
Hiroshima University	T. Sugitate
University of Tokyo (INS)	Y. Akiba, H. Hamagaki, S. Hayashi, S. Homma, Y. Ikeda
Kyushu University	K. Kimura
Lawrence Livermore National Laboratory	H.C. Britt, N. Namboodiri, T.C. Sangster, J. Thomas
Massachusetts Institute of Technology	M.A. Bloomer, V. Cianciola, B.A. Cole, J.B. Costales, L. Grodzins, H.Z. Huang, R.J. Ledoux, D. Morrison, R.J. Morse, C.G. Parsons, M. Sarabura, R. Soltz, S.G. Steadman, G.S.F. Stephens, V. Vutsadakis, D.S. Woodruff
University of California Space Sciences Laboratory	H.J. Crawford, J. Engelage
University of California at Riverside	T. Abbott, S.-Y. Fung, J. Kang
University of Tokyo	R. Hayano, H. Sakurai
Spokesmen:	R.J. Ledoux, L.P. Remsberg

This heavy ion experiment will extend the inclusive cross section measurements of E802 over a significantly larger kinematic range and perform high-precision two-particle measurements on particles produced in nucleus-nucleus collisions. The goal is to provide a comprehensive body of data on inclusive (π , K, p, d) and two-particle correlations ($\pi\pi$, K^+K^+ and pp) which may provide insight into the formation of high density nuclear matter, its subsequent space-time evolution, source kinematics and possible thermodynamic properties.

Schematic diagram of target array for low beam intensity bombardments.

Schematic diagram of target array for high beam intensity bombardments.

*Experiment 862 - Electromagnetic Dissociation of ^{59}Co and ^{197}Au
by ^{139}La and ^{197}Au*

Iowa State University	J.C. Hill, F.K. Wohn, L. Siphai
Brookhaven National Laboratory	J.B. Cumming
Michigan State University	J.A. Winger
Spokesman:	J.C. Hill

Electromagnetic dissociation (ED) is a purely electromagnetic process occurring in relativistic heavy ion (RHI) reactions in which the Coulomb field of one of the participants generally excites a giant resonance in the other. The most likely decay channel for heavy nuclei is by one-neutron emission. ED was first reported in accelerator experiments (projectile fragmentation) by Heckman and Lindstrom and for target fragmentation by the experimental group. The ED cross section for the reaction $^{197}\text{Au}(^{139}\text{La}, X)^{196}\text{Au}$ at 1.26 GeV/nucleon was measured to be 1.97 ± 0.13 barns. The experimenters now propose to extend their measurements of the ED process to higher energies by measuring yields of target fragments from the collision of ^{139}La and ^{197}Au on ^{59}Co and ^{197}Au targets.

863

E815 EMULSION CALORIMETER

Experiment 863 - Au Beam Exposures for E815 (Particle Production and Nuclear Fragmentation in Collisions of Heavy Ions in Nuclear Targets at AGS Energies)

Hua-Zhong Normal	X. Cai, H. Huang, L.S. Liu, W.Y. Quian, Z.Q. Weng, C. Zhou, J.C. Zhou
IHEP, Alama-Ata.	Z.V. Ameeva, N.P. Andreeva, Z.V. Anzon, V.I. Bubnov, I.Y. Chasnikov, G.Z. Eligbaeva, L.E. Eremenko, A.S. Gaitinov, G.S. Kalyachkina, E.K. Kanygina, C.I. Shakhova
IHEP, Beijing	G.F. Xu, P.Y. Zheng
Institute of Nuclear Physics, Tashkent	U.G. Gulyamov, S.H. Nasyrov, N.V. Petrov
University of Jaipur	K.B. Bhalla, V. Kumar, P. Lal, S. Lokanathan, S. Mookerjee, R. Raniwala, S. Raniwala, V.S. Shukla
University of Jammu	A. Bhasin, A. Gill, S. Kachroo, G.L. Kaur, L.K. Mangora, N.K. Rao
Lawrence Livermore Laboratory	E.M. Friedlander, H.H. Heckman, P.J. Lindstrom
Lebedev Institute of Physics	M.I. Adamovich, Y.A. Alexandrov, M.M. Chernyavski, S.G. Gerassinov, S.P. Kharlamov, V.G. Larionova, N.V. Maslennikova, G.I. Orlova, N.G. Peresadko, N.S. Salmanova, M.I. Tretvakova
University of Lund	S. Garpman, I. Otterlund, S. Persson, K. Soderstrom, E. Stenlund
NRC, Canada	B. Judek
Panjab University	M.M. Aggarwal, R. Arora, V.S. Bhatia, I.S. Mitra, B. Singh
Phillips University	B. Dressel, E.R. Ganssauge, S. Hackel, C. Mueller, J. Rhee, W. Schultz
Physical-Technical Institute, Tashkent	L.P. Chernova, S.I. Gadzhieva, K.G. Gulyamov, K.G. Gulamov, F.G. Kaydrov, N.S. Lukicheva, V.S. Nasyrov, L.N. Svechnikova
Shanxi Normal University, Linfen	S.B. Luo, J.F. Sun, D.H. Zhang
University of Washington	T.H. Burnett, J.G. Grote, T. Koss, J.J. Lord, D. Skelding, S.C. Strausz, R.J. Wilkes
Spokesmen:	R.J. Wilkes (U.S. Spokesman) and I. Otterlund (Overall Spokesman)

Intended to produce moderate-statistics (≈ 1000 events), high resolution results within 1 year of exposure, this experiment will measure, on an event by event basis, pseudo-rapidity density distributions, density fluctuations, multiplicity and angular distribution of nuclear fragments and recoiling protons (30-400 MeV), cross sections for production and interaction of light and medium ($Z = 2-8$) projectile fragments, and k_T , the partial inelasticity for production of photons.

Experiment 865 - Proposal to Perform an Improved Search for the Decay
 $K^+ \rightarrow \pi^+ \mu^+ e^-$

Brookhaven
National Laboratory

D. Lazarus, H. Ma, P. Pile, P. Rehak

Paul Scherrer Institute

J. Egger, W. Herold, H. Kaspar

Yale University

M.E. Zeller

Spokesman:

M.E. Zeller

This is a proposal to perform a new search for the decay $K^+ \rightarrow \pi^+ \mu^+ e^-$ with a sensitivity of $\sim 3 \times 10^{-12}$ (90% C.L.). The method employed is the same as that of Exp. 777; that experiment achieved a sensitivity of 2.1×10^{-10} . The improvement of a factor of approximately 70 comes from the following factors: improved K^+ beam x7; larger acceptance apparatus x3; longer data acquisition period x2.3; improved hardware and software efficiency x1.5. In addition to the search for $K^+ \rightarrow \pi^+ \mu^+ e^-$, 50,000 events will be collected from the decay $K^+ \rightarrow \pi^+ e^+ e^-$. There will be the potential in later experiments to measure the CP violating component of the polarization of the μ^+ in the decay $K^+ \rightarrow \pi^+ \mu^+ \mu^-$ with a precision of $\sim 10\%$ and the potential to measure the CP violating symmetries in the decays $K^\pm \rightarrow \pi^+ \pi^- \pi^\pm$ with a statistical precision of 10^{-5} .

A plan view showing both magnetic spectrometers in place. The upper spectrometer is the same as was used in E802 and E859 and will operate at angles $> 20^\circ$. The lower "forward" spectrometer will operate between 6 and 20 degrees.

996

Experiment 866 - Studies of Particle Production at High Baryon Density Using the Au Beam

Argonne National Laboratory	S. Kaufman
Brookhaven National Laboratory	D. Beavis, C. Chasman, Z. Chen, Y.Y. Chu, J.B. Cumming, R. Debbe, S. Gushue, O. Hansen, M.J. LeVine, Y. Miake, B. Moskowitz, J. Olness, L.P. Remsberg, M. Tanaka, M.J. Tannenbaum, J.H. van Dijk, F. Videbaek, H. Wegner
Columbia University	K. Kurita, S. Nagamiya, T. Nayak, P. Stankus, O. Vossnack, Y. Wu, W.A. Zajc
Hiroshima University	T. Sugitate
Institute for Nuclear Study, University of Tokyo	Y. Akiba, H. Hamagaki, S. Hayashi, S. Homma, Y. Tanaka
Kyushu University	K. Kimura
Lawrence Livermore Laboratory	H.C. Britt, M.N. Namboodiri, T.C. Sangster, J.H. Thomas
Massachusetts Institute of Technology	V. Cianciolo, B.A. Cole, J.B. Costales, W. Kehoe, R.J. Ledoux, D. Morrison, R.J. Morse, P. Rothschild, R. Soltz, S.G. Steadman, G.S.F. Stephens, T. Sung, D.S. Woodruff, D. Zachary
University of California Space Sciences Laboratory	H.J. Crawford, J. Engelage
University of California at Riverside	P. Beery, S.-Y. Fung, J. Kang, R. Seto
University of Tokyo	R.S. Hayano, H. Sakurai, K. Shigaki, Y. Shimizu, H. Tamura
Spokesmen:	C. Chasman and H. Hamagaki

In keeping with the original purpose of E802 and E859, this experiment will continue the investigation of semi-inclusive single particle spectra using the gold beam (1) to measure the particle momentum spectra as a function of p_t and y ; (2) to find how these cross sections vary with "central" or "peripheral" collisions as taken from the event characterizing detectors; to measure two-particle correlations; to look for systemic variations in the cross sections with different beams and targets so as to clarify the reaction dynamics; and to seek evidence in these measurements for the production of very dense nuclear matter, or ultimately, the quark-gluon plasma.

Publications of AGS Experiments 1982 - 1990

This listing was originally prepared using the SLAC database SPIRES; we now rely on the experimenters themselves to supply us with information. It is easy to miss publications in such a wide search and we apologize for any left out or misidentified. Please let us know about these as well as keeping us posted on your recent publications of AGS experiments.

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