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AGS EXPERIMENTS - 1989, 1990, 1991

J. C. Depken

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AGS Department
Experimental Planning and Support Division

BROOKHAVEN NATIONAL LABORATORY

Associated Universities, Inc.

Upton, New York 11973

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AGS Experiments – 1989, 1990, and 1991

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This is an *eighth edition*. Please forward suggestions and changes for future edition to:

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The cutoff date for approved experiments to be included in this report was January 1, 1992.

AGS BEAMS January 1992

Separated Beams for General Use

Beam	GeV/c	$\delta p/p$ (% fwhm)	Prod Ang $\Delta\theta$ (deg)	(mm)	Flux/ 10^{13} protons on target							GeV/c	Purity	Remarks
					K^+	K^-	p	$\bar{p}$	π^+	π^-				
B2,B4	1.5-6(K)	5	3.0	0.3	2.7×10^6	1.2×10^6	2.0×10^6	1.0×10^6	4.0×10^6	3.0×10^6		4.0	$\pi^-/K^- = 3$	L=81m, MESB, Will become Test Beam after FY92 run
C2,C4	1.5-9($\bar{p}$)	4	10.5	2.6	9.0×10^6	3.2×10^6	2.0×10^6	2.0×10^6	8.0×10^6	8.0×10^6		5.0	$\pi^-/\bar{p} = 1.4$	L=15m, LESBI, removed after FY91
C4'	≤ 0.85	4	0.0	12.	3.0×10^6	1.0×10^6	1.0×10^6	1.4×10^6	6.0×10^6	6.0×10^6		0.75	$\pi^+/K^+ < 1$	L=18m, LESBII, Commission FY92
C6,C8	≤ 0.75	5	5.0	10.	3.0×10^6	1.0×10^6	1.0×10^6	1.4×10^6	6.0×10^6	6.0×10^6		0.80	$\pi^+/K^+ = 5$	L=15m, LESBII
D6	≤ 1.9	6	5.0	1.6	2.0×10^6	0.8×10^6	3.0×10^6	0.5×10^6	2.0×10^6	2.0×10^6		0.70	$\pi^-/K^- = 3.5$	L=31m, 2GEV Beam Line
												1.70	$\pi^-/\bar{p} = .02$	

Unseparated Charged Beams

A1*	5-28	3	0	0.2	1.9×10^6	2.9×10^6	5.0×10^6	2.3×10^6	3.0×10^7	1.0×10^7		18		L=130m to MPS, "OR" w/A3
A2	1-10	5	12	0.3	3.4×10^7	1.1×10^7	3.0×10^7	3.0×10^7	3.0×10^7	1.0×10^7		2		Test Beam, remove after FY92
A2'	<6.5	5	3.5	0.75			4.0×10^6	3.7×10^6	7.4×10^6	5.1×10^6		6		L=27m, Construction FY92-93, E365
A3*	1-28	4	0	0.1			6.0×10^6		1.0×10^6	4.0×10^7		14		SSC Test Beam, "OR" w/A1
B1*	5-28	3	0	0.05			3.0×10^6		3.0×10^7	2.0×10^7		14		Primarily heavy ions
B2'	<9		6											Test Beam after FY92
C1	1-20	5	0	0.8	3.0×10^7	3.5×10^6	1.0×10^6	0.7×10^6	3.5×10^6	2.5×10^6		13		L=61m, "OR" w/C5
C5*	1-28	2	0	0.15			1.0×10^6					13		L=81m, Primarily heavy ions

Neutral Beams

B5	2-15		1-4.5	0.1	K_L^0 flux = 5.0×10^6							2-16	$n/K_L^0 = 6$	L=10m, "OR" w/B1
----	------	--	-------	-----	----------------------------------	--	--	--	--	--	--	------	---------------	------------------

Muon Channel

D2	0.025- 0.15(μ)	9(π) 30(μ)	135(π)	24(π)	μ^+ flux = 2.0×10^6 Surface μ^+ flux = 2.0×10^6								$e^-/\mu^- = 8$	Commission in FY92
----	-------------------------	---------------------------	--------------	-------------	--	--	--	--	--	--	--	--	-----------------	--------------------

Neutrino Beam

U					ν flux = $2.0 \times 10^{10}/m^2$ Wide Band $\bar{\nu}$ flux = $1.4 \times 10^{10}/m^2$ Wide Band		FEB flux avg. over 1.5m R. <E> = 1.4GeV/c Wide Band						
---	--	--	--	--	--	--	--	--	--	--	--	--	--

g-2 $\pi-\mu$ Transfer Line

V1	<3.0	0.6	0		π^+ flux = 1.6×10^6 μ^+ flux = 7.3×10^6							3.0		Fast Spill for injection into g-2 ring Commission in FY94
----	------	-----	---	--	--	--	--	--	--	--	--	-----	--	--

* These 0° beam lines can be used for full energy polarized protons and/or heavy ion beams

RUNNING
PARASTIC RUNNING
SUBJECT TO APC APPROVAL
FACILITY COMMISSIONING

BY: K. WOODLE
DATE: 7-24-91

FY1991

[illegible]

H Y 1992 AGS SCHEDULE

BY: P. PILE
DATE: 3-16-92

- SUBJECT TO CHANGE -
(100 HOURS PER WEEK)

██████████ RUNNING
ZZZZZZZZ PARASTIC RUNNING
XXXXXXXXXX SUBJECT TO APC APPROVAL
XXXXXXXXXX FACILITY COMMISSIONING

AGS MODE			S												P		S											
EXP. NO.	EXPERIMENTER	HRS.	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT														
A1	TEST BEAM-MPS																											
A2	TEST BEAM																											
A3 878	CRAWFORD	0 100																										
A3 SSC	GORDON																											
A3 852	CHUNG/DZIERBA	0 200																										
B1 859	ZAJC/REMSBERG	1181																										
B1 866	CHASMAN/HAMAGAKI	0 1800																										
B2 881	LINDENBAUM	0 2800																										
B5 871	MOLSON	729 500																										
B5 888	MITCHELL/MOJICKI	0 3800																										
	COUSINS/SCHWARTZ	0 400																										
C1 850	CARROLL/HEPPELMANN	141 200																										
C4 787	UTTERBERG	585 200																										
C5 814	SMITH/ERTYMAN	324 1800																										
C5 877	BRAUN-MUNZINGER	0 3500																										
C6 781	BRAUN-MUNZINGER	0 1100																										
C6 874	MAY-DEUTSCH	968 100																										
	HUNGERFORD	0 1028																										
	PETERSON/CHREN	800																										
D2 876	KOSSLER	0 300																										
D6 813	BARNES/FRANKLIN	703 300																										
D6 886	IMAI/PILE	0 1800																										
	SMALL HIP EXPERIMENTS																											
A 844	CUMMING	0 100																										
A3 882	PRICE	0 50																										
A3 863	OTTERLUND	0 28																										
A3 868	WADDINGTON	0 22																										
A3 875	JAIN	0 2																										
A3 883	HEINRICH	0 10																										
B1/A 862	HILL	0 38																										
B1 869	WADDINGTON	0 32																										
	EXPERIMENTS NOT SCHEDULED																											
- 880	LEE/RATNER	0 120																										
A1 817	BONNER/ROBERTS	700 1300																										
A3 864	SANDWEISS	0 1200																										
U 841	MANN	0 340																										
V1 821	MORSE/HUGHES/ROBERTS	65 2100																										
A1 852	CHUNG/DZIERBA	0 2300																										
A2 865	ZELLER	0 1800																										
C6 887	SAWAFTA/HICKS	0 800																										
C8 856	KALOGEROPOULOS	0 500																										</

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Summaries of Experiments

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 a 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.

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.

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, hyperons, and supersymmetric neutrals predicted by current theories.

Will Measure Γ^p , Γ^n , Γ^π 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	M. Athanas, 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 $K^- + A \rightarrow \pi^- + {}^A_{\Lambda}$ reaction to form ${}^4_{\Lambda}\text{He}$ and ${}^5_{\Lambda}\text{He}$, it is proposed to determine the lifetime 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 AGS 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 lifetime 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, J. Belz, P. Buchholz, C. Guss, V.L. Highland, S. Kettell, 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.

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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.

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0 1 2m

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

University of Michigan	P.R. Cameron, G.R. Court, D.G. Crabb, G. DeMuth, 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, V.K. Wong
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 scattered a high intensity unpolarized proton beam from a polarized proton target and measured the left-right asymmetry (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 7.1 (GeV/c)² was measured. The physics motivation was both the study of the totally unexplored area beyond $P_{\perp}^2 = 6.5$ (GeV/c)² and the improvement of the precision out to $P_{\perp}^2 = 6.5$ (GeV/c)² where AGS experiment E748 found a huge and unexpected value of A. The experiment observed with good precision that A continues to rise in this previously unexplored hard-scattering region.

Beam: D2
Status: Complete in 1989
Approved Hours: 3103

*Experiment 796 - μ SR Experiments on Hydrides,
Fluctuating Magnetic Fields in Solids and Knight Shifts*

College of William and Mary	W.J. Kossler, H. Schone
Virginia State University	C.E. Stronach
George Mason University	W.F. Lankford
Columbia University	Y.J. Uemura
Spokesman:	W.J. Kossler

Using the D4 stopping muon beam, this experiment carried out six μ SR experiments. The experiments are:

1. Muon sites and motion in non-magnetic hydrides.
2. Field fluctuations and magnetic hydrides.
3. A study of the one-dimensional antiferromagnetic $(\text{CH}_3)_4\text{NMnCl}_3$.
4. Strain induced muon precession frequency shifts in ferromagnets.
5. Magnetic fields in heavy fermion superconductors.
6. Giant Knight shifts in vacancies.

*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. Debbe, 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.

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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. Bonner, 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.

811

Experiment 811 - Radiative Kaon Capture and Hyperon Weak Radiative Decay

Boston University	K.P. Gall, E.K. McIntyre, J.P. Miller, B.L. Roberts, T. Warner, D. Whitehouse
University of Birmingham	N. Hessay, J. Lowe
University of British Columbia	M.D. Hasinoff, D.F. Measday, A. Noble
Central Research Institute for Physics, Budapest	D. Horváth
TRIUMF	M. Salomon
Brookhaven National Laboratory	M. Sakitt
Case Western Reserve University	W. Fickinger, D.K. Robinson
University of New Mexico	B. Bassalleck, K.D. Larson, D.M. Wolfe
Spokesman:	B.L. Roberts

E811 consisted of two phases. In the first phase branching ratios for radiative kaon capture reactions $K^- + p \rightarrow \Lambda + \gamma$, $K^- + p \rightarrow \Sigma^0 + \gamma$, as well as for $K^- + d \rightarrow \Lambda + \gamma + n$ were measured. K^- were stopped in a liquid hydrogen (deuterium) target and the photon spectrum in coincidence with a stopped kaon was measured with a high resolution NaI(Tl) detector. The branching ratios for the radiative capture reactions have been published.^{1,2} The proton results were not in agreement with simple quark model predictions, and the branching ratio for the $\Lambda\gamma$ final state from K^- capture on deuterium was a factor of two larger than that found for the $\Lambda\gamma$ final state from capture on hydrogen. At the same time that the radiative capture experiment was done, the branching ratio for the weak radiative decay $\Sigma^+ \rightarrow p + \gamma$ was measured. Σ^+ were tagged by detecting the π^- from $K^- + p \rightarrow \Sigma^+ + \pi^-$ in range telescopes, and the photons were detected with a 49 element NaI(Tl) array. The results agreed well with other experiments.³ In the second phase the branching ratio was measured for the weak radiative decay $\Lambda \rightarrow n + \gamma$. K^- were stopped in liquid hydrogen; Λ production was tagged by the monoenergetic π^0 from $K^- + p \rightarrow \Lambda + \pi^0$. The LAMPF crystal box, a 2π 396 element NaI(Tl) detector was used to detect photons following stopped kaons, and charged particles from the target were vetoed at the trigger level. The experiment was triggered on total energy deposited in the crystal box, and sorted off-line according to photon multiplicity. The analysis is in the final stage and will be ready for publication soon.

¹ D.A. Whitehouse et al., Phys. Rev. Lett. 63, 1352 (1989).

² K.P. Gall et al., Phys. Rev. C42, R475 (1990).

³ N.P. Hessay et al., Z. Physik, C42, 175 (1989).

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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, V. Zeps
University of Birmingham	J. Lowe, J. Nelson, R. Zybert
Brookhaven National Laboratory	S. Bart, R. Chrien, P. Pile, R. Sawafta, R. Sutter
Freiburg University	P. Birien, T. Buerger, J. Franz, N. Hamann, ¹ E. Rössle, H. Schmitt
Indiana University Cyclotron Facility	J. Szymanski
University of Kyoto	T. Iijima, K. Imai, A. Masaike, K. Miyake
University of Kyoto-Sangyo	K. Okada, F. Takeuchi
University of Manitoba	A. Berdoz, D. Davis, N. Davison, S. Page, D. Ramsay, V. Sum, W. van Oers
University of New Mexico	B. Bassalleck, A. Rusek, D. Wolfe
CEN, Saclay	P. Birien
TRIUMF	D. Gill
Vassar College	R.L. Stearns
Spokesmen:	G. Franklin and 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.

¹ Located at CERN.

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 National Laboratory	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. Belwied, 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, R. Majka, J. Mitcheli, F. Rotondo, J. Sandweiss, B. Shivakumar
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.

EXPERIMENTAL LAYOUT for E-817

Beam: B2
Status: Awaiting polarized
proton run
Approved Hours: 1300

Experiment 817 - Polarization Transfer in Hyperon Production

Rice University	D.L. Adams, S. Ahmad, B.E. Bonner, J.A. Buchan, 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 ($D_{NN} \sim 0$) 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.

Beam: A1
Status: Complete in 1990
Approved Hours: 1150

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 Λ -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.

G-2 π - μ BEAM

Momentum Bands

π : $\sigma = \pm 0.36\%$

μ : $\sigma = \pm 0.42\%$

Flux @ Inflector Exit

$1.2 \cdot 10^7 \pi^+ / 10^{12} \text{ prot on targ}$

$7.2 \cdot 10^4 \mu^+ / 10^{12} \text{ " " "}$

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

Boston University	D.H. Brown, R.M. Carey, E. Hazen, F. Krienen, J.P. Miller, B.L. Roberts, L.R. Sulak, C. Wang, W. Worstell
Brookhaven National Laboratory	H.N. Brown, G. Bunce, J.R. Cullen, Jr., G.T. Danby, J.W. Jackson, S. Mane, M. May, W.-Z. Meng, W. Morse, A. Prodel, R. Shutt, P.A. Thompson, K. Woodle
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	W.P. Lysenko
Max Planck Institut fur Med. Forschung, Heidelberg	U. Haeberlen
University of Tokyo	M. Iwasaki, K. Nagamine
National Laboratory for High Energy Physics (KEK)	K. Endo, H. Hirabayashi, S. Ichii, S. Kurokawa, K. Mashata, Y. Mizumachi, S. Sakamoto, T. Sato, 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	H. Ahn, P. Cushman, S.K. Dhawan, F.J.M. Farley, X. Fei, S. Hou, V.W. Hughes
Spokesmen:	V.W. Hughes, W.M. Morse, B.L. Roberts

The anomalous gyromagnetic ratio of the muon (g-2) will be measured to 0.36 ppm or a factor of 20 times better than it is currently known. The predicted contribution to (g-2) from the first order $W^\pm$ and Z^0 radiative correction is predicted to be 1.7 ppm so this experiment will provide a direct test of the electroweak radiative correction, and hence of the renormalizability of the Glashow-Weinberg-Salam theory. Since a_μ is sensitive to a wide range of non-standard model effects, there is a window in which to search for new physics. W or muon substructure, supersymmetry and the existence of new gauge bosons are several possibilities. A 14m diameter superferric muon storage ring is under construction and will be complete by 1993. The plan is to be ready for data collection in FY 1994.

Beam: C2
Status: Complete in 1989
Approved Hours: 16

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 S. Bart, R.E. Chrien, P.H. Pile, R.J. Sutter, T.E. Ward
Laboratory

Massachusetts M. Deutsch
Institute of
Technology

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.

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

Tel-Aviv University	J. Alster, D. Ashery, J. Lichtenstadt, Y. Mardor, M.A. Moinester, E. Piasetzky, R. Weise, A.I. Yavin
Brookhaven National Laboratory	S. Bart, R.E. Chrien, T. Kishimoto, P.H. Pile, R. Sawafta, R.J. Sutter
Texas A&M University	R.C. Hiebert, R.A. Krauss
Vassar College	R.L. Stearns
TRIUMF	R.R. Johnson, R. Olshevsky
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.

Experimental apparatus for ${}^3\text{He}$ target H particle search.

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

University of Birmingham	J. Lowe, J. Nelson, R. Zybert
Brookhaven National Laboratory	S. Bart, R. Chrien, P. Pile, R. Sawafta, 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, ¹ E. Rössle, H. Schmitt
University of Kyoto	T. Iijima, K. Imai, A. Masaike, K. Miyake
Kyoto Sangyo University	K. Okada, F. Takeuchi
Indiana University Cyclotron Facility	J. Szymanski
University of Manitoba	A. Berdoz, C. Davis, N. Davison, S. Page, D. Ramsay, V. Sum, W. van Oers
University of New Mexico	B. Bassalleck, A. Rusek, 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.

¹ at CERN.

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.

840

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

Non-Accelerator
Status: Complete in 1991
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.

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 Au¹⁹⁷ 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 ¹⁶O 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 and 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 $K_L^0 \rightarrow \pi^0 e^+ e^-$ 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 $B(K_L^0 \rightarrow e^+ e^- e^+ e^-) < 2.6 \times 10^{-8}$; about two orders of magnitude above the expected rate.

847

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 , ^{197}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

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.

850

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

Brookhaven National Laboratory	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
University of Massachusetts-Dartmouth	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 built. 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.

LEFT SIDE

RIGHT SIDE

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 $K^+ \rightarrow \pi^+ e^+ e^-$.

852

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, P.T. Smith, T. Sulanke, 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. Ostrivodov, 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.B. Roberts, J. Skeens
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
Bloomsburg University	L. Gray
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	L. Huang, T. Kalogeropoulos, J. Reed, Z. Sobolewski, K. Wang, T. Young
SUNY Health Science Center	D. Bassano, S. Manglos, S.C. Prasad
Spokesman:	T. Kalogeropoulos

The potential of antiprotons for practical applications within present antiproton collection capabilities is promising. Suggested applications include direct 3D electron density imaging, 3D multi-elemental imaging, guiding precise and easy delivery of ion beams to targets, and radiation therapy.

In this initial phase of the research, the following physics questions will be addressed: (a) Comparison of antiproton capture rates in complex targets with the Z-law; (b) Studies of the annihilation mechanism in nuclei. These studies of physics interest on their own right will provide as well basic information in evaluating the proposed applications.

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

$$\pi^- p \rightarrow \pi^+ \pi^- n$$

$$\pi^+ p \rightarrow \pi^+ \pi^0 p$$

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. The data have been accepted for publication in the Physical Review.

A1 and A3 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
Johns 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 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.

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. Debbe, 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. Stephans, 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
Speakersmen:	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.

Beam:
Status: To run in FY 1992
Approved Hours: 36

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

Iowa State University	L. Ewell, J.C. Hill, F.K. Wohn
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 this 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.

Layout of the emulsion chamber with two microscope fields of view.

In E863, nuclear emulsions are used as detectors to study ultrarelativistic heavy-ion interactions. The principle aim of the experiment is to investigate global aspects of the multiparticle production like the mass and energy dependence of charged particle multiplicities, angular distributions of charged particles, and target and projectile break-up. The experiment, however, also focuses on local particle density fluctuations. Indications of a Quark Gluon Plasma phase transition in terms of high overall particle densities combined with large local fluctuations are studied.

Within the collaboration two complementary techniques are used, each with its own advantage. The conventional technique with horizontally exposed stacks is predominantly used for obtaining minimum bias data, and for special studies of the target break-up. In order to gain maximal resolution in interactions of extreme multiplicities, where many particles are produced in a narrow forward cone, the usage of vertically exposed emulsion chambers facilitates the measurement.

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

Alma Ata, Institute of High Energy Physics	N.P. Andreeva, Z.V. Anson, V.I. Bubnov, I.Y. Chasnicov, G.Z. Eligbaeva, L.E. Eremenko, A.S. Gaitinov, G.S. Kalyachkina, E.K. Kanygina, V.N. Lepetan, T.I. Shakova
Beijing, Acadmica Sinica	G.F. Xu, P.Y. Zheng
Lawrence Berkeley Lab.	E.M. Friedlander, H.H. Heckman, P.J. Lindstrom, F.M. Pottag
Carleton University	B. Judek (NRC, Ottawa)
Chandigarh, Panjab Univ.	M.M. Aggarwal, R. Arora, V.S. Bhatia, I.S. Mittra
Changsha, Hunan Education Institute	Y.X. Li, Z.G. Liu, L. Lu, Z.Q. Weng, Y.L. Xia
Dubna, JINR	M. Karabova, S.A. Krasnov, G.S. Shabratova, K.D. Tolstov, S.Vokal
Jaipur, University of Rajasthan	K.B. Bhalla, S.K. Gupta, V. Kumar, P. Lal, S. Lokanathan, S. Mookerjee, H.S. Palsania, R. Raniwala, S. Raniwala
University of Jammu Jammu	S.K. Badyal, A. Bhasin, S. Kachroo, G.L. Kaul, L.K. Mangotra, N.K. Rao
Leningrad, Khlopin Radium Institute	V.G. Bogdanov, V.A. Plyushev, Z.I. Solovieva
Linfen, Shanxi Normal	X. Chan, S.B. Luo, Y.M. Qin, D.H. Zhang
University of Lund	S. Garpman, B. Jacobsson, I. Otterlund, K. Soderstrom, E. Stenlund
Marburg, Phillips University	E.R. Ganssauge, E. Koch, J.T. Rhee, K. Staendekke
Moscow, Lebedev Institute	M.I. Adamovich, Y.A. Alexandrov, M.M. Chernyavski, S.G. Gerassimov, S.P. Kharlamov, V.G. Larionova, N.V. Maslennikova, G.I. Orlova, N.G. Peresadko, V.M. Rappoport, N.A. Salmanova, M.I. Tretvakova
Seattle, University of Washington,	T.H. Burnett, J.G. Grote, T. Koss, J. Lord, D. Skelding, S. Strausz, R.J. Wilkes
Tashkent, Institute of Nuclear Physics	E.S. Basova, H. Nasrulaeva, S.Z. Nasyrov, N.V. Petrov, D.A. Qarshiev, T.P. Trofimova, U.I. Tuleeva
Tashkent, Physical- Technical Institute	L.P. Chernova, K.G. Gulamov, F.G. Kaydrov, N.S. Lukicheva, V.S. Navotney, N. Saidkhanov, L.N. Svechnikova, S.I. Zhochova
Wuhan, Hua-Zhong Normal University	X. Cai, H. Huang, L.S. Liu, W.Y. Quian, Z.Q. Wang, D.C. Zhou,
Yerevan, Physics Institute	F.A. Avetyan, N.A. Marutyan, L.G. Sarkisova, V.R. Sarkisyan
Spokesmen:	R.J. Wilkes (U.S.) and I. Otterlund (Overall)

μ IDENTIFIER

CALORIMETER

1m

LEFT SIDE

RIGHT SIDE

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.

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. Stephans, 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.

868

Schematic diagram of emulsion stack exposures.

Schematic diagram of the emulsion chamber exposures.

Beam: A3
Status: To run in FY 1992
Approved Hours: 22

*Experiment 868 - Exp. 808-Interactions of 14.1 GeV/nucleon nuclei from ^{16}O to ^{197}Au
in light and heavy targets*

University of Minnesota P.S. Freier, J. Kapusta, D. Seibert, C.J. Waddington

Louisiana State University M.L. Cherry, W.V. Jones, K. Sengupta, J.P. Wefel

Institute of Nuclear Physics, Krakow R. Holynski, A. Jurak, A. Olszewski, M. Szarska, A. Trzupek,
B. Wilczynska, H. Wilczynski, W. Wolter, B. Wosiek,
K. Wozniak

Institute of Theory and Experimental Physics Moscow A.I. Dubinina, O.K. Egorov, E.D. Kolganova,
E.A. Pozharova, T.Yu. Skorotko, V.A. Smirnitski

Spokesman: **C.J. Waddington**

The Krakow-Louisiana-Minnesota (KLM) collaboration has previously exposed small stacks of nuclear emulsions to the light nuclei beams available from the AGS, Exp. 808. The results of this work, when combined with similar exposures of stacks and chambers made at CERN to higher energy beams, EMU07, have been reported in a number of papers. When beams of heavier nuclei become available with the commissioning of the Booster, the KLM-Moscow collaboration (KLM²) plans to extend this study to include beams of nuclei as heavy as gold and lead at the highest energies available from each accelerator.

Fragments from Au + X collisions

Schematic diagram, not to scale

Schematic diagram of the detector setup used for the May 1990 Bevalac runs. Ion chambers I - 1 to 4 are four gap parallel plate chambers filled with P10 gas. Cherenkov counters C - 1 to 3 contain radiators of Pilot 425 plastic mounted in white diffusion boxes. The MWPC wires have a 1 mm spacing and the target holder can place any one of 8 targets in the beam by remote command. The number of signals recorded for each detector is shown in parentheses.

Beam: B1
Status: To run in FY1992
Approved Hours: 32

Experiment 869 - Measurement of Fragment Yields for 14 GeV/nucleon Au + X Collisions

University of Minnesota C.J. Waddington
Washington University W.R. Binns, J. Klarmann
Caltech J.R. Cummings, T.L. Garrard, E.C. Stone
Spokesman: **C.J. Waddington**

The experimenters propose to continue a study of the fragmentation of UH nuclei begun at the Bevalac as part of a cosmic ray program, conducting additional experiments at the LBL Bevalac and the new Booster facility at the Brookhaven AGS. The experiments at the AGS will expand the energy range of the measurements upwards to match the energies of the majority of observed cosmic ray nuclei, while those at LBL will expand them downwards to study the rapid variations that occur at low energies. These measurements will improve the ability to predict those cross sections for the production of fragments from projectiles that have not been studied and allow better calculations of the abundances of the cosmic ray UH nuclei at the sources by taking account the effects of propagation on the observed abundances. These measurements will also extend our current studies of the nuclear physics topics of factorization, limiting fragmentation, charge pickup, Coulomb dissociation and fission. The short initial exposure to high energy gold nuclei requested here should indicate the magnitude of the energy dependence of these production cross sections with increasing energy and hence the need for further exposures.

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Experiment 871 - A New Search for Very Rare K_L Decays

University of California at Irvine	A. Heinson, W.R. Molzon
Stanford University	M. Diwan, G.M. Irwin, D.A. Ouimette, A.J. Schwartz, S.G. Wojcicki
Temple University	J. Belz, C.M. Guss, V.L. Highland, S.H. Kettell, W.K. McFarlane
University of Texas at Austin	G.W. Hoffman, K. Land, J. McDonough, P.J. Riley, J.L. Ritchie, C.B. Ware, S. Worm, A. Yamashita
College of William and Mary	M. Eckhause, A.D. Hancock, J.R. Kane, Y. Kuang, W.F. Vulcan, R.E. Welsh, R.G. Winter, M. Witkowski
Spokesmen:	W.R. Molzon, J.L. Ritchie, S.G. Wojcicki

This group proposes to carry out a new search for the decays $K_L \rightarrow \mu e$ and $K_L \rightarrow ee$, building on the experience from the recently completed experiment, E791. The $K_L \rightarrow \mu\mu$ branching ratio measurement will also be improved. The final E791 single event sensitivity for $K_L \rightarrow \mu e$ will be about $1-2 \times 10^{-11}$. The new experiment will reach a single event sensitivity below 10^{-12} , and if no events are observed, will set an upper limit of about 2×10^{-12} . About 10,000 $K_L \rightarrow \mu\mu$ decays will also be observed.

The experiment will take the novel approach of stopping the neutral beam in a beam stop near the upstream end of the spectrometer. Another novel feature will be the operation of a tracking detector inside the vacuum decay region.

Proposed experimental layout showing the Moby Dick Spectrometer.

Experiment 874 - Kaon-Nucleus Quasielastic and Elastic Scattering
at 720 MeV/c

University of Colorado	C. Kormanyos, R.J. Peterson, J. Wise
University of Houston	E. Hungerford, B.W. Mayes, L. Pinsky
Brookhaven National Laboratory	S. Bart, R. Chrien, R. Sawafta, R.J. Sutter
Spokesmen:	R.E. Chrien, E. Hungerford, R.J. Peterson

Incoherent quasielastic scattering of positive kaons should show their putatively long free path through a simple proportionality of nuclear cross sections to the number of target nucleons in isosymmetric ($T=0$) targets. In this case, one can search for evidence of alternations to the free characteristics of nucleons when placed in the interior of a nucleus by precision comparison of quasielastic scattering on several $T=0$ targets with varying volume to surface ratios. Elastic K^+ scattering on some of these targets at the same beam momentum allows a similar but independent test of altered nucleons by way of optical model methods.

Therefore, the experimenters propose to investigate K^+ elastic and quasifree scattering from nuclear systems to provide more accurate data to compare to theory, and to investigate possible momentum dependence in the scaling parameters to better reconcile the theory with the recent total cross section measurements.

Beam: A3
Status: To run in FY 1992
Approved Hours: 2

*Experiment 875 - Study of Particle Production and Nuclear Fragmentation in
Relativistic Heavy-Ion Collisions in Nuclear Emulsions*

State University of
New York at Buffalo

A.Z.M. Ismail, P.L. Jain, G. Singh

Spokesman:

P.L. Jain

Nuclear emulsions will be used to study the nuclear collisions of ^{197}Au , ^{32}S and any other heavy-ion beams when they are available. On an event-by-event basis, shower particle multiplicity, pseudorapidity density and density fluctuations of charged particles, charge multiplicity and angular distribution of projectile fragments, production and interaction cross section of heavily ionizing particles emitted from the target fragmentation, will be measured in nuclear emulsion. 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.

Beam: D2
Status: To run in FY 1993
Approved Hours: 300

Experiment 876 - μ^+ Surface Beam Characterization

College of William
and Mary

A. Greer, W.J. Kossler, H.E. Schone

Virginia State University M.R. Davis, C.E. Stronach

George Mason University W.F. Lankford

Columbia University G. Luke, B. Sternlieb, Y.J. Uemuera

Spokesman: **W.J. Kossler**

This experiment proposes to characterize the μ^+ beam produced from π decay on the surface of the D-line production target. Comparisons to similar beams at TRIUMF indicate that a flux in excess of $10^5/\text{cm}^2$ per pulse for 10^{13} protons per pulse might be expected. Such an intensity would make μSR at Brookhaven National Laboratory competitive with TRIUMF and PSI for the majority of this type of research.

EB14	EXPERIMENT 814	12/10/90	EXPERIMENT 814	12/10/90
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Beam: C5
Status: Begin running in FY92
Approved Hours: 1100

*Experiment 877 - Study of Relativistic Nuclear Collisions with Heavy Beams
using the E814 4π Calorimetry and Modified Forward Spectrometer*

Brookhaven National Laboratory	D. Lissauer, T. Ludlam, S. McCorkle, E. O'Brien, V. Polychronakos, H. Takai, T. Throwe, C. Woody
GSI, Darmstadt	N. Herrmann
McGill University	J. Barrette, S. Gilbert, R. Lacasse, S.K. Mark, C. Pruneau
University of New Mexico	B. Bassalleck, J. Hall, J. Lowe, D. Wolfe
University of Pittsburgh	W. Cleland
University of Sao Paulo	O. Dietzsch
SUNY at Stony Brook	R. Bellwied, P. Braun-Munzinger, G. David, J. Dee, T.K. Hemmick, B. Hong, W. Llope, M. Muthuswami, J. Stachel, N. Xu, Y. Zhang, Z. Zou
Texas A&M University	T. Cormier, H. Dejbakhsh, S. Dutta, Q. Li, W. Trzaska
Spokesman:	P. Braun-Munzinger

Using the E814 set-up with appropriate modifications, this experiment proposes to study central collisions between heavy nuclei and projectiles from the Booster/AGS accelerators. The main emphasis is on a detailed study of the energy flow into 4π and measurements of the spectra of nucleons and produced particles for rapidities $y > 1.5$ and low transverse momenta, with event characterization over the full solid angle. In addition, nucleons, nuclear fragments and produced particles in the target fragmentation region will be measured.

A1 and A3 lines

Beam: A3
Status: To run in FY 1992
Approved Hours: 300

*Experiment 878 - Investigation of Antinucleus Production and Search for New Particles
in Nucleus-Nucleus Collisions at the AGS*

University of California, SSL	H.J. Crawford, J. Engelage, L. Greiner
Brookhaven National Laboratory	D. Beavis, R. Debbe
University of California at Los Angeles	J. Carroll, G. Igo
KEK	J. Chiba, K.H. Tanaka
Waseda University	T. Doke, T. Kashiwagi, J.H. Kikuchi
Johns Hopkins University	T. Hallman
University of Tokyo	R.S. Hayano, Y. Shimizu
Lawrence Berkeley Laboratory	I. Flores, H. Heckman, P.J. Lindstrom, R. Wright
Columbia University	S. Nagamiya, P. Stankus
Universities Space Research Association	J. Mitchell
Spokesman:	H.J. Crawford

The purpose of this experiment (a follow on of the E858 program) is to investigate antideuteron and rare particle production in Au-Au collisions at the AGS using the A1 or A3 line as a beam line spectrometer. The goal is to further investigate the hadronization process with a systematic study of pA, SiA and AuA collisions, to determine the production cross section for $\bar{d}$ s from these systems and to provide high statistic measurements of the π^- , K^- , $\bar{p}$ spectra at 0° over a broad range of secondary momenta, 0.5GV to 12 GV.

POLARIZED PROTON COLLISIONS AT BROOKHAVEN

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Experiment 880 - The Effects of a Partial Siberian Snake on Polarization at the AGS

Indiana University	D. Caussyn, T. Ellison, H. Huang, B. Jones, S.Y. Lee, P. Schwandt
Brookhaven National Laboratory	L. Ahrens, J. Alessi, G. Bunce, P. Cameron, E.D. Courant, H.W.J. Foelsche, J. Geller, Y.Y. Lee, Y.I. Makdisi, S.R. Mane, L. Ratner, T. Roser, J.F. Skelly, A. Soukas, S. Tepikian, W. van Asselt
Argonne National Laboratory	H. Spinka, L. Teng, D.G. Underwood, A. Yokosawa
KEK	S. Hiramatsu, Y. Mori, H. Sato, K. Yokoya
TRIUMF	U. Wienands
Spokesmen:	S.Y. Lee and L. Ratner

This group will build a 4.7 Tesla-meter room temperature solenoid which will be installed in a 10-foot long AGS straight section. AGS polarized proton beam time will be used to perform *partial snake experiments*. These experiments will test the idea of using a partial snake to correct all depolarizing imperfection resonances and also test the feasibility of betatron tune jump in correcting intrinsic resonances in the presence of a partial snake.

A Schematic of the MPS II Experimental Arrangement for ϕ Experiments.

Beam: B2
Status: To run in FY 1992
Approved Hours: 1500

*Experiment 881 - Utilizing $\phi\phi$ Spectroscopy to Search for Exotic Glueballs,
Exotic Hybrid or Exotic Multiquark States*

Brookhaven Nat. Lab. and
City College of New York

S.J. Lindenbaum

Brookhaven National
Laboratory

R.W. Hackenburg, R.S. Longacre

City College of New York

C.S. Chan, M.A. Kramer, K. Zhao, Y. Zhu

Rensselaer Polytechnic
Institute

G. Adams, K. Vaziri

Spokesman:

S.J. Lindenbaum

The powerful $\phi\phi$ spectroscopy which resulted in the discovery of $I^{GJPC} = 0^{+2}++$ $g_T(2010)$, $g_T(2300)$ and $g_T(2340)$ (which are prime glueball candidates) will be used to search for exotic glueballs, exotic hybrids and exotic multiquark states.

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Layout of first experiment, showing end of beam pipe, Pb target, and slowing stacks of CR-39 plastic detectors alternating with Pb, at a distance of 1 m downstream from the target. Shaded stacks consist of 12 repeat units of CR-39/Pb; unshaded stacks consist of 3 repeat units.

Layout of second experiment, showing end of beam pipe, Pb target, high-field region of bending magnet, and three tracking chambers consisting of 25 thin CR-39 sheets at 2 cm intervals.

Beam: A3
Status: To run in FY 1992
Approved Hours: 50

*Experiment 882 - Search for Particles with $|Z| \geq 3$ and Negative Charge or Large A/Z
Produced in Central Nucleus-Nucleus Collisions*

University of California Y. He, D.M. Lowder, P.B. Price
at Berkeley

Spokesman: **P.B. Price**

Two experiments are proposed which will use CR-39 track detectors to study production of multiply charged composites in central collisions, and in particular search for both positively and negatively charged mid-rapidity particles with $|Z| \geq 3$, especially those with anomalously large A/Z .

Publications of AGS Experiments 1982 - 1991

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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Dutta, S.	Texas A&M University (877)
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Eckhause, M.	College of William and Mary (871, 791)
Egger, J.	Paul Scherrer Institute (SIN) (851, 865)
Egorov, O.K.	Institute of Theory and Experimental Physics, Moscow (868)
Eiseman, S.E.	Brookhaven National Laboratory (854)
Eligbaeva, G.Z.	Alma Ata, Institute for High Energy Physics (863)
Ellison, T.	Indiana University (880)
Empl, T.	Rice University (854, 810)
Endo, K.	National Laboratory for High Energy Physics (KEK) (821)
Engelage, J.	University of California, Space Sciences Labora- tory (878, 866, 859, 858, 802)
Eremenko, L.E.	Alma Ata, Institute of High Energy Physics (863)
Etkin, A.	Brookhaven National Laboratory (854, 810)
Ewell, L.	Iowa State University (862)
Farley, F.J.M.	Yale University (821)
Fatyga, M.	Brookhaven National Laboratory (814)
Fei, X.	Yale University (821)
Felawka, L.	TRIUMF (787)
Fickinger, W.	Case Western Reserve University (857, 856, 811)
Flores, I.	Lawrence Berkeley Laboratory (878)
Foelsche, H.W.J.	Brookhaven National Laboratory (880)
Foley, K.J.	Brookhaven National Laboratory (854, 810)
Fox, D.	Los Alamos National Laboratory (814)
Foxford, T.O.	Indiana University (852)
Frank, J.S.	Brookhaven National Laboratory (787)
Franklin, G.	Carnegie-Mellon University (836, 813, 788)
Franz, J.	Freiburg University (836, 813)
Freier, P.S.	University of Minnesota (868)
Friedlander, E.M.	Lawrence Berkeley Laboratory (863)
Fukshima, H.	Kobe University (831)
Fukuda, T.	Institute for Nuclear Studies - Tokyo (820)
Fukuda, T.	Osaka University (829)
Fukushima, H.	Kobe University (831)
Fung, S.Y.	University of California at Riverside (866, 859, 802)
Gaitinov, A.S.	Alma Ata, Institute of High Energy Physics (863)
Gall, K.P.	Boston University (811)
Ganssauge, E.R.	Phillips University, Marburg (863)
Garpman, S.	University of Lund (863)

Garrard, T.L.	Caltech (869)
Geller, J.	Brookhaven National Laboratory (880)
Gerassimov, S.G.	Lebedev Institute, Moscow (863)
Gialas, I.	University of Michigan (794)
Gibbs, W.R.	Los Alamos National Laboratory (854)
Gilbert, S.	McGill University (877)
Gill, D.	TRIUMF (836, 820, 813)
Ginkel, J.	College of William and Mary (791)
Glass, G.	Texas A&M University (794)
Gordon, H.A.	Brookhaven National Laboratory (851)
Grace, R.	Carnegie-Mellon University (788)
Gray, L.	Bloomsburg University (856)
Greene, S.V.	Yale University (814)
Greenlee, H.	Yale University (845)
Greer, A.	College of William and Mary (876)
Greiner, L.	University of California, SSL (878)
Gribushin, A.	Moscow State University (852)
Grigoriev, D.N.	Institute for Nuclear Physics, Novosibirsk (821)
Grodzins, L.	Massachusetts Institute of Technology (859, 802)
Grote, J.G.	University of Washington (863)
Gulamov, K.G.	Physical-Technical Institute, Tashkent (863)
Gupta, S.K.	University of Rajasthan, Jaipur (863)
Gushue, S.	Brookhaven National Laboratory (866, 859, 850, 802)
Guss, C.M.	Temple University (871)
Hackenburg, R.W.	Brookhaven National Laboratory (881, 854, 810)
Haeberlen, U.	Max Planck Institut für Med. Forschung, Heidelberg (821)
Hadley, N.J.	Yale University (851)
Haggerty, J.S.	Brookhaven National Laboratory (787)
Halama, H.	Brookhaven National Laboratory (840)
Hall, J.	University of New Mexico (877, 857, 814)
Hallman, T.	Johns Hopkins University (878, 858, 854, 817, 810)
Hamagaki, H.	University of Tokyo and INS (866, 859, 802)
Hamann, N.	Freiburg University (CERN) (836, 813)
Hancock, A.D.	College of William and Mary (871)
Hansen, O.	Brookhaven National Laboratory (866, 859, 802)
Hara, T.	Kobe University (831)
Harshman, D.R.	AT&T Bell Laboratories (849)
Hart, G.	Los Alamos National Laboratory (791)
Hasinoff, M.D.	University of British Columbia (857, 811)
Haustein, P.E.	Brookhaven National Laboratory (844)
Hayano, R.S.	University of Tokyo (878, 866, 859, 858, 802)

Hayashi, S.	University of Tokyo and INS (866, 802)
Hazen, E.	Boston University (821)
He, Y.	University of California at Berkeley (882)
Heckman, H.	Lawrence Berkeley Laboratory (878, 863, 858)
Heifetz, R.	University of Tel-Aviv (814)
Heinson, A.	University of California (871)
Heller, K.J.	University of Minnesota (850)
Hemmick, T.	Yale University (814)
Hemmick, T.K.	State University of New York at Stony Brook (877)
Heppelmann, S.	Pennsylvania State University (850)
Herold, W.D.	Paul Scherrer Institute (SIN) (851, 865)
Herrmann, N.	GSI, Darmstadt (877)
Herrmann, N.	State University of New York at Stony Brook (814)
Hertzog, D.	Carnegie-Mellon University (788)
Hessy, N.	University of Birmingham (811)
Hicks, K.	Ohio State University (820)
Hiebert, J.C.	Texas A&M University (835)
Highland, V.L.	Temple University (871, 791)
Hill, J.C.	Iowa State University (862)
Hirabayashi, H.	National Laboratory for High Energy Physics (KEK) (821)
Hiramatsu, S.	KEK (880)
Hoffman, G.W.	University of Texas at Austin (871)
Hoffman, G.W.	University of Texas (829)
Hogue, R.	Brookhaven National Laboratory (814)
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Homma, S.	University of Tokyo and INS (866, 859, 802)
Hong, B.	State University of New York at Stony Brook (877)
Horvath, D.	Central Research Institute for Physics, Budapest (857, 811)
Hou, S.	Yale University (821)
Huang, H.	Hua-Zhong Normal University, Wuhan (863)
Huang, H.	Massachusetts Institute of Technology (859, 802)
Huang, H.	Indiana University (880)
Huang, L.	Syracuse University (856)
Hughes, V.W.	Yale University (821)
Hungerford, E.	University of Houston (874, 829, 820, 788, 781, 774)
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Igo, G.	University of California at Los Angeles (878)
Ikeda, Y.	University of Tokyo and INS (859, 802)
Iijima, T.	University of Kyoto (836, 813)
Imai, K.	University of Kyoto (836, 813)

Irwin, G.M.	Stanford University (871, 791)
Ishida, K.	University of Riken (821)
Ismail, A.Z.M.	State University of New York at Buffalo (875)
Ito, M.M.	Princeton University (787)
Iwasaki, M.	University of Tokyo (821)
Jackson, J.W.	Brookhaven National Laboratory (821)
Jacobsson, B.	University of Lund (863)
Jain, P.L.	State University of New York at Buffalo (875, 847)
Jastrzembski, E.	Brookhaven National Laboratory (845)
Jayananda, K.	University of Pittsburgh (814)
Johns, K.	University of Minnesota (850, 817)
Johnson, R.R.	TRIUMF (835)
Johnston, K.	University of Houston (820)
Jones, B.	Indiana University (880)
Jones, W.V.	Louisiana State University (868)
Joyce, D.	College of William and Mary (791)
Judek, B.	Carleton University, NCR Ottawa (863)
Jungmann, K.	University of Heidelberg (821)
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Juricic, I.	Columbia University (859, 802)
Kachroo, S.	University of Jammu (863)
Kalogeropoulos, T.	Syracuse University (856)
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Kang, J.	University of California at Riverside (866, 859, 802)
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Kasha, H.	Yale University (845)
Kashiwagi, T.	Waseda University (878, 858)
Kaspar, H.	Paul Scherrer Institute (SIN) (851, 865)
Katcoff, S.	Brookhaven National Laboratory (844, 802)
Kaufman, S.	Argonne National Laboratory (866, 859, 802)
Kaufman, W.A.	University of Michigan (794)
Kaul, G.L.	University of Jammu (863)
Kaydrov, F.G.	Physical-Technical Institute, Tashkent (863)
Kehoe, W.	Massachusetts Institute of Technology (866)
Kenney, C.	College of William and Mary (791)
Kern, W.	Southeastern Massachusetts University (852, 818)
Kettell, S.H.	Temple University (871)
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Kharlamov, S.P.	Lebedev Institute, Moscow (863)

Khiari, F.Z.	University of Michigan (794)
Kikuchi, J.H.	Waseda University (878, 858)
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King, E.	Southeastern Massachusetts University (818)
Kinnison, W.W.	Los Alamos National Laboratory (791)
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Kirk, H.	Brookhaven National Laboratory (818)
Kirk, P.	Louisiana State University (858)
Kishimoto, T.	University of Houston (835, 829, 788)
Kishimoto, T.	Osaka University (820)
Kitching, P.	TRIUMF (787)
Klarmann, J.	Washington University (869)
Kmit, M.	Brookhaven National Laboratory (850)
Knibbe, P.	University of Pennsylvania (791)
Koch, E.	Phillips University, Marburgh (863)
Koehler, A.	Harvard Cyclotron Laboratory (856)
Kolganova, E.D.	Institute of Theory and Experimental Physics, Moscow (868)
Konaka, A.	TRIUMF (787)
Konigsberg, J.	University of California at Los Angeles (791)
Kormanyos, C.	University of Colorado (874)
Koss, T.	University of Seattle (863)
Kossler, W.J.	College of William and Mary (876, 796)
Kramer, M.A.	City College of New York (881, 810)
Krasnov, S.A.	Dubna, JINR (863)
Kraus, D.	University of Pittsburgh (814)
Krauss, R.A.	Texas A&M University (835, 820)
Krienen, F.	Boston University (821)
Krisch, A.D.	University of Michigan (794)
Kruglov, N.	Moscow State University (852)
Kuang, Y.	College of William and Mary (871)
Kubic, J.	University of California at Los Angeles (791)
Kumar, V.	University of Rajasthan, Jaipur (863)
Kuno, Y.	TRIUMF (787)
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Kurita, K.	Columbia University (866, 859, 802)
Kurokawa, S.	National Laboratory for High Energy Physics (KEK) (821)
Kycia, T.F.	Brookhaven National Laboratory (787)
Lacasse, R.	McGill University (877)
Lal, P.	University of Rajasthan, Jaipur (863)
Lang, K.	University of Texas at Austin (871, 791)
Lankford, W.F.	George Mason University (876, 796)

Larionova, V.G.	Lebedev Institute, Moscow (863)
Larsen, R.C.	Brookhaven National Laboratory (845)
Larson, K.D.	Case Western Reserve University (857, 811)
Lazarus, D.M.	Brookhaven National Laboratory (865, 851, 840)
Ledoux, R.J.	Massachusetts Institute of Technology (866, 859, 802)
Lee, A.M.	Yale University (851)
Lee, D.M.	Los Alamos National Laboratory (791)
Lee, S.Y.	Indiana University (880)
Lee, Y.Y.	Brookhaven National Laboratory (880)
Leipuner, L.B.	Brookhaven National Laboratory (845)
Lepetan, V.N.	Alma Ata, Institute of High Energy Physics (863)
LeVine, M.J.	Brookhaven National Laboratory (866, 859, 802)
Li, K.K.	Brookhaven National Laboratory (787)
Li, Q.	Texas A&M University (877)
Li, Y.X.	Changsha, Junana Education Institute (863)
Lichtenstadt, J.	Tel-Aviv University (835)
Lin, A.M.T.	University of Michigan (794)
Lindenbaum, S.J.	City College of New York and Brookhaven National Laboratory (881, 854, 810)
Lindenbusch, R.	Indiana University (852)
Lindstrom, P.J.	Lawrence Berkeley Laboratory (878, 863, 858, 855,)
Lissauer, D.	Brookhaven National Laboratory (877, 814)
Littenberg, L.S.	Brookhaven National Laboratory (787)
Liu, L.S.	Hua-Zhong Normal University, Wuhan (863)
Liu, Z.G.	Changsha, Hunan Education Institute (863)
Llope, W.	State University of New York at Stony Brook (877, 814)
Lokanathan, S.	University of Rajasthan, Jaipur (863)
Longacre, R.S.	Brookhaven National Laboratory (881, 854, 810)
Lord, J.	University of Washington (863)
LoSecco, J.	University of Notre Dame (852)
Louis, W.C.	Los Alamos National Laboratory (787)
Lowder, D.M.	University of California at Berkeley (882)
Love, W.A.	Brookhaven National Laboratory (854, 810)
Loveland, W.	Oregon State University (844)
Lowe, J.	University of Birmingham (857, 836, 813, 811)
Lowe, J.	University of New Mexico (877)
Lowenstein, D.I.	Brookhaven National Laboratory (850)
Lu, L.	Changsha, Hunan Education Institute (863)
Lubatti, H.J.	University of Washington (851)
Lubell, M.S.	City College of New York (821)
Ludlam, T.	Brookhaven National Laboratory (877, 855, 814)
Luke, G.	Columbia University (876)

Lukicheva, N.S.	Physical-Technical Institute, Tashkent (863)
Luo, S.G.	Shanxi Normal, Linfen (863)
Lysenko, W.P.	Los Alamos National Laboratory (821)
Ma, H.	Brookhaven National Laboratory (851, 865)
Macdonald, J.A.	TRIUMF (787)
Madansky, L.	Johns Hopkins University (854, 817, 810)
Maher, C.	Carnegie-Mellon University (836, 813, 788)
Majka, R.	Yale University (814)
Makdisi, Y.	Brookhaven National Laboratory (880, 850)
Makowiecki, D.	Brookhaven National Laboratory (814)
Manak, J.	University of Notre Dame (852)
Mane, S.	Brookhaven National Laboratory (880, 821)
Manglos, S.	SUNY Health Science Center (856)
Mangotra, L.K.	University of Jammu (863)
Mannelli, E.	Yale University (845)
Mao, L.	Louisiana State University (858)
Mardor, I.	Tel-Aviv University (850)
Mardor, Y.	Tel-Aviv University (850, 835)
Margulies, J.	Stanford University (791)
Mariscotti, M.	University of Buenos Aires (802)
Mark, S.K.	McGill University (877, 814)
Marlow, D.R.	Princeton University (787)
Marshak, M.L.	University of Minnesota (850)
Marshall, T.	Indiana University (818)
Marutyan, N.A.	Physics Institute, Yerevan (863)
Masaike, A.	University of Kyoto (836, 813)
Mashata, K.	National Laboratory for High Energy Physics (KEK) (821)
Maslennikova, N.V.	Lebedev Institute, Moscow (863)
Mathiazhagen, C.	University of California at Irvine (791)
May, M.	Brookhaven National Laboratory (821, 781)
Mayes, B.	University of Houston (829, 820, 781, 774)
Mays, W.B.	University of Houston (874)
McCorkle, S.	Brookhaven National Laboratory (877)
McCrary, R.	Carnegie-Mellon University (788)
McDonough, J.	University of Texas at Austin (871)
McElfresh, M.W.	IBM (839)
McFarlane, W.K.	Temple University (871, 791)
McIntyre, E.K.	Boston University (811)
McKee, R.J.	Los Alamos National Laboratory (791)
Meaday, D.F.	University of British Columbia (811)
Melese, P.	University of California at Los Angeles (791)
Melissinos, A.C.	University of Rochester (840)

Meng, W.-Z.	Brookhaven National Laboratory (821)
Meyers, P.D.	Princeton University (787)
Miake, Y.	Brookhaven National Laboratory (866, 859, 802)
Miettinen, H.E.	Rice University (854, 817, 810)
Miller, C.A.	TRIUMF (794)
Miller, J.P.	Boston University (857, 821, 811)
Mills, A.P.	AT&T Bell Laboratories (849)
Milner, E.C.	Los Alamos National Laboratory (791)
Minor, E.	Pennsylvania State University (850)
Mitchell, J.	Universities Space Research Association (878)
Mitchell, J.	Yale University (814)
Mittra, I.S.	Chandigarh, Panjab University (863)
Miyagaki, M.	Kobe University (831)
Miyake, K.	University of Kyoto (836, 813)
Mizumachi, Y.	National Laboratory for High Energy Physics (KEK) (821)
Moinester, M.A.	Tel-Aviv University (835)
Molzon, W.R.	University of California (871, 791)
Mookerjee, S.	University of Rajasthan, Jaipur (863)
Mori, Y.	KEK (880)
Morris, T.W.	Brookhaven National Laboratory (854, 810)
Morrison, D.	Massachusetts Institute of Technology (866, 859)
Morse, R.J.	Massachusetts Institute of Technology (866, 859, 802)
Morse, W.M.	Brookhaven National Laboratory (845, 821)
Moskowitz, B.	Brookhaven National Laboratory (866, 859, 802)
Murphy, C.	Indiana University (852)
Mutchler, G.S.	Rice University (854, 818, 817, 810)
Muthuswami, M.	State University of New York at Stony Brook (877, 814)
Nagamine, K.	University of Tokyo (821)
Nagamiya, S.	Columbia University (878, 866, 859, 858, 802)
Nagoshi, C.	University of Tokyo - INS (831)
Namboodiri, N.	Lawrence Livermore National Laboratory (866, 859)
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Nasyrov, S.Z.	Institute of Nuclear Physics, Tashkent (863)
Navon, I.	Tel-Aviv University (835)
Navotney, V.S.	Physical-Technical Institute, Tashkent (863)
Nayak, T.	Columbia University (866)
Nelson, J.	University of Birmingham (836, 813)
Nezrick, F.A.	Fermilab (840)
Nicholson, H.	Mt. Holyoke College (850)

Noble, A.	University of British Columbia (857, 811)
Northcliff	Texas A&M University (794)
Numao, T.	TRIUMF (787)
O'Brien, E.	Brookhaven National Laboratory (877, 814)
O'Fallon, J.R.	University of Notre Dame/U.S. Department of Energy (794)
Ohl, K.	Yale University (845)
Okada, K.	Kyoto Sangyo University (836, 813)
Olness, J.	Brookhaven National Laboratory (866, 859, 802)
Olshevsky, R.	TRIUMF (835)
Olszewski, A.	Institute of Nuclear Physics, Krakow (868)
Omata, K.	University of Tokyo - INS (831)
Orlov, Y.	Cornell University (821)
Orlova, G.I.	Lebedev Institute, Moscow (863)
Ostrvidov, A.	Moscow State University (852)
Otterlund, I.	University of Lund (863)
Ouimette, D.A.	Stanford University (871, 791)
Padley, P.	TRIUMF (787)
Page, S.	University of Manitoba (836, 813)
Palsania, H.S.	University of Rajasthan, Jaipur (863)
Parsons, C.	Massachusetts Institute of Technology (859, 802)
Peaslee, D.C.	University of Maryland (854, 794)
Peresadko, N.G.	Lebedev Institute, Moscow (863)
Peterson, R.J.	University of Colorado (874)
Petrov, N.V.	Institute of Nuclear Physics, Tashkent (863)
Phelps, R.A.	University of Michigan (794)
Piasetzky, E.	Tel-Aviv University (850, 835)
Piekarz, H.	University of Houston (829, 820, 774)
Pile, P.H.	Brookhaven National Laboratory (865, 836, 835, 829, 820, 813, 788, 781, 774)
Pinsky, L.	University of Houston (874, 829, 781, 774)
Platner, E.D.	Brookhaven National Laboratory (854, 810)
Plyushev, V.A.	Khlopin Radium Institute, Leningrad (863)
Polychronakas, V.	Brookhaven National Laboratory (877, 814)
Pottag, F.M.	Lawrence Berkeley Laboratory (863)
Poutissou, J.-M.	TRIUMF (787)
Poutissou, R.	TRIUMF (787)
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Prasad, S.C.	SUNY Health Science Center (856)
Price, P.B.	University of California-Berkeley (882, 793)
Prodell, A.	Brookhaven National Laboratory (840, 839, 821)

Proskuryakov, A.	Moscow State University (852)
Protopopescu, S.D.	Brookhaven National Laboratory (818)
Pruneau, C.	McGill University (877, 814)
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Quian, W.Y.	Hua-Zhong Normal University, Wuhan (863)
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Quinn, B.	Carnegie-Mellon University (836, 813, 788)
Ramsay, D.	University of Manitoba (836, 813)
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Raniwala, S.	University of Rajasthan, Jaipur (863)
Rao, N.K.	University of Jammu (863)
Rappoport, V.M.	Lebedev Institute, Moscow (863)
Ratner, L.G.	Brookhaven National Laboratory (880, 794)
Ray, A.	Oak Ridge National Laboratory (855)
Raylman, R.R.	University of Michigan (794)
Raymond, R.S.	University of Michigan (794)
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Reed, J.	Syracuse University (856)
Rehak, P.	Brookhaven National Laboratory (851, 865)
Remsberg, L.P.	Brookhaven National Laboratory (866, 859, 802)
Rhee, J.T.	Phillips University, Marburgh (863)
Riley, P.J.	University of Texas at Austin (871)
Ritchie, J.L.	University of Texas at Austin (871)
Ritchie, J.	Stanford University (791)]
Rivers, C.	University of Michigan (850)
Rizzo, C.	CERN, Trieste (840)
Roberts, B.L.	Boston University (857, 821, 811)
Roberts, J.B.	Rice University (854, 818, 817, 810, 794)
Robinson, D.K.	Case Western Reserve University (857, 856, 811)
Roser, T.	University of Michigan (794)
Roser, T.	Brookhaven National Laboratory (880)
Rössle, E.	Freiburg University (836, 813)
Rothschild, P.	Massachusetts Institute of Technology (866)
Rotondo, F.	Yale University (814)
Roy, J.	TRIUMF (787)
Rozen, J.R.	IBM (839)
Rozon, M.	Carnegie-Mellon University (836, 813)
Rubin, P.	University of California at Los Angeles (791)
Ruchti, R.C.	University of Notre Dame (852)
Rusek, A.	University of New Mexico (836, 813)
Russell, J.J.	Southeastern Massachusetts University (850)
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Sanders, G.H.	Los Alamos National Laboratory (791)
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Sangster, T.C.	Lawrence Livermore National Laboratory (866, 859)
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Sato, H.	KEK (880)
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Saulys, A.C.	Brookhaven National Laboratory (854, 810)
Sawafta, R.	Brookhaven National Laboratory (874, 836, 835, 813)
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Sengupta, K.	Louisiana State University (868)
Seto, R.	University of California at Riverside (866)
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Shakova, T.I.	Alma Ata, Institute of High Energy Physics (863)
Shapira, D.	Oak Ridge National Laboratory (855)
Shatunov, Ya. M.	Institute for Nuclear Physics, Novosibirsk (821)
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Shigaki, K.	University of Tokyo (866)

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Skelding, D.	University of Washington (863)
Skelly, J.	Brookhaven National Laboratory (880)
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Slater, W.E.	University of California at Los Angeles (791)
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Smith, A.J.S.	Princeton University (787)
Smith, P.T.	Indiana University (852)
Snow, G.	University of Michigan (850)
Sobolewski, Z.	Syracuse University (856)
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Solovieva, Z.I.	Khlopin Radium Institute, Leningrad (863)
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Zhochova, S.I.	Physical-Technical Institute, Tashkent (863)
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Zhou, D.C.	Hua-Zhong Normal University, Wuhan (863)
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