2
1-27-81

300

(1)

(RP)

LA-7444-SR, Rev.

Status Report

MASTER

LAMP

Proposal Status and Summaries

University of California

LOS ALAMOS SCIENTIFIC LABORATORY

Post Office Box 1663, Los Alamos, New Mexico 87545

This work was supported by the US Department
of Energy, Division of Nuclear Physics.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

LAMPF

Proposal Status and Summaries

Compiled by

**Lois Rayburn
Beverly Talley**

Revision 1 issued October 1979
Revision 2 issued November 1980

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545
Telephone Ext:

OFFICE MEMORANDUM

TO : Holders of LA-7444-SR

DATE: October 20, 1980

FROM : *Lois Rayburn* *Beverly Talley*
Lois Rayburn & Beverly Talley

SUBJECT : UPDATING LAMPF PROPOSAL STATUS & SUMMARY REPORT, LA-7444-SR

SYMBOL : MP-DO

MAIL STOP : MS-832

Attached are revisions, updates, and additions to the LAMPF Proposal Status and Summary Report, LA-7444-SR. Please make replacements and additions as indicated below:

1. Remove pages v to xix; replace with pages v to xxi. The new status sheets reflect the July 1980 PAC meeting.
2. Remove pages c1 to c28 (Table of Contents by Channel); replace with pages c1 to c40. To incorporate the titles of the proposals received in 1980, the Contents by Channel has been redone.
3. Remove pages 115 to 116; replace with new pages. The title on Exp. 194 has been corrected.
4. Remove pages 177 to 178; replace with new pages. Experiment 309 has a title change, updated participant list and a new summary.
5. Remove pages 191 to 194; replace with new pages. Experiment 336 has a supplemental summary.
6. Remove pages 251 to 252; replace with new pages. Experiment 449 has a title correction.
7. Remove page 293; replace page 293 and add pages 294 to 336. This includes summaries for Proposals 530 to 609. Proposals 530 to 557 are from the January 1980 PAC and proposals 558 to 609 are from the July 1980 PAC.

drc

LAMPF

PROPOSAL STATUS

STATUS OF PROPOSALS AS OF 01/10/16.

THIS REPORT REFLECTS THE JULY 1980 PAC ACTIONS.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN		PAC-HRS
1	1	WITHDRAWN	NEXT-PAC	LEP	TROWER	W.P.	0.0
2	1	COMPLETE		LEP	JAKOBSON	M.J.	150.0
	2	COMPLETE		LEP			448.0
3	1	WITHDRAWN	PARASITE-O	SMC	KYNSEY	B.B.	0.0
4	1	COMPLETE	W/15	HRS	IGG	G.J.	100.0
5	1	COMPLETE		HRS	CHRISTEN	R.E.	200.0
					PALEVSKY	H.	0.0
6	1	WITHDRAWN		HRS	SUTTER	R.J.	0.0
					IGG	G.J.	0.0
7	1	COMPLETE	WITH-12	SMC	SHERA	E.B.	60.0
	2	COMPLETE		SMC			480.0
8	1	INACTIVE		LEP	BUDICK	B.	0.0
					DERMAN	S.	0.0
9	1	COMPLETE		EPICS	MCCARTHY	J.S.	500.0
					MORRIS	C.L.	0.0
10	1	APPROVED	W/233	HRS	SPENCER	J.E.	140.0
11	F-S	WITHDRAWN	101/69/155	SMC	BOEHM	F.	0.0
12	1	COMPLETE		SMC	POWERS	R.J.	120.0
	2	COMPLETE		SMC	KUNSELMAN	A.R.	96.0
13	1	COMPLETE		EPICS	SETH	K.K.	200.0
14	1	COMPLETE		EPICS	THIESSEN	H.A.	250.0
	2	COMPLETE		EPICS			200.0
15	1	COMPLETE	W/4	HRS	IGG	G.J.	200.0
	2	COMPLETE		HRS	TANAKA	N.	200.0
	3	COMPLETE		HRS			90.0
16	1	INACTIVE		SMC	MEYER	S.L.	10.0
17	1	WITHDRAWN		EPICS	MORRISON	G.C.	230.0
					SETH	K.K.	0.0
					ZEIDMAN	B.	0.0
18	1	COMPLETE		EPICS	ZEIDMAN	B.	250.0
	2	COMPLETE		EPICS			250.0
	3	COMPLETE		EPICS			72.0
19	1	INACTIVE		BIOMED	LETSEFF	A.J.	75.0
20	1	WITHDRAWN			HAHN	A.A.	0.0
21	1	REJECTED			BROLLEY	J.E.	0.0
22	1	WITHDRAWN		EPICS	GEMMELL	D.S.	150.0
23	1	COMPLETE		EPICS	WHARTON	W.R.	250.0
24	1	WITHDRAWN	FEAS-STUDY	NEUTRINO-A	LANDE	K.	0.0
25	1	COMPLETE		LEP	BURMAN	R.L.	200.0
	2	COMPLETE		LEP			180.0
	3	COMPLETE		LEP			250.0
26	1	COMPLETE		EPB	VEESER	L.R.	100.0
27	1	COMPLETE		EPB	WILLARD	H.B.	300.0
	2	COMPLETE		EPB			200.0
	3	COMPLETE	APP-DETERM				0.0
28	1	COMPLETE		LEP	YAVIN	A.I.	150.0
29	1	COMPLETE	WITH-54	LEP	PREFDOM	B.M.	0.0
	2	COMPLETE	W/54	LEP			0.0

STATUS OF PROPOSALS AS OF 10/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
30	1	REJECTED			DIETERLE	0.0
31	1	COMPLETE		NEUTRINO-A	NEETHY	800.0
	2	COMPLETE		NEUTRINO-A		0.0
32	1	COMPLETE		P3	MC FARLANE	300.0
	2	APPROVED		P3	MACEK	800.0
33	1	ABSORBED	BY 335	EPB	MUTCHLER	0.0
					WINSKY	0.0
34	1	COMPLETE		P3	MINEHART	220.0
35	1	COMPLETE		LEP	ZIOCK	112.0
36	1	WITHDRAWN		P3	GUGELDT	0.0
37	1	COMPLETE		SNC	HUGHES	300.0
	2	COMPLETE		SNC	CRANE	550.0
38	1	WITHDRAWN		NEUTRINO-A	REINES	0.0
39	1	COMPLETE	COMB/D 342	EPICS	MACEK	175.0
					THIESSEN	0.0
40	1	WITHDRAWN			FRANKEL	0.0
41	1	WITHDRAWN		EPICS	BOWEN	0.0
42	1	COMPLETE		EPB	COLE	380.0
43	1	WITHDRAWN		EPICS	SWENSON	250.0
44	1	COMPLETE		BIOHED	CARLSON	30.0
45	1	COMPLETE		BSA-RAD	DIDZYAK	0.0
	2	COMPLETE		BSA-RAD	GREEN	0.0
					GIORGI	0.0
46	1	WITHDRAWN		EPICS	PETERSON	300.0
47	1	WITHDRAWN		EPICS	PETERSON	100.0
48	1	WITHDRAWN		EPICS	PETERSON	0.0
49	1	COMPLETE		HRS	PETERSON	150.0
50	1	COMPLETE		LEP	CROWE	300.0
	2	COMPLETE		LEP	CROWE	224.0
51	1	COMPLETE		SNC	MALANTFY	100.0
52	1	WITHDRAWN	ACCEL-DEV	EPB	BRYANT	0.0
53	1	WITHDRAWN	FEAS-STUDY	NEUTRINO-A	DAVIS	0.0
54	1	COMPLETE	WITH-29	LEP	DREEDON	112.0
	2	COMPLETE	W/29	LEP		165.0
55	1	WITHDRAWN		AB	SHIVELY	0.0
					HADDONCK	0.0
56	1	COMPLETE		AB	NORTHCLIFF	400.0
	2	COMPLETE		AB	SIMMONS	500.0
57	1	WITHDRAWN			RICHMAN	0.0
					GRICE	0.0
58	1	COMPLETE	WITH 120	P3	NEFKENS	0.0
					FITZGERALD	0.0
59	1	WITHDRAWN		HRS	MACEK	250.0
60	1	COMPLETE		SNC	KNIGHT	200.0
	2	COMPLETE		SNC	SCHILLACI	340.0
61	1	WITHDRAWN		EPICS	MAGLE	200.0
62	1	WITHDRAWN		P3	LIND	0.0
63	1	REJECTED			GRAN	0.0
64	1	WITHDRAWN			SEAGRAVE	0.0
65	1	COMPLETE		AB	SIMMONS	250.0
66	1	COMPLETE	FEAS STUDY	AB	SIMMONS	300.0
	2	COMPLETE		AB		400.0
67	1	COMPLETE		P3	DRONESKY	100.0
				LEP		0.0
	2	COMPLETE		P3		72.0
				LEP		11.0
68	1	WITHDRAWN		P3	HUGHES	0.0
69	F-S	WITHDRAWN	11/101/155	SNC	LU	0.0
70	1	WITHDRAWN			FETKOVICH	0.0
71	1	REJECTED			KNOWLES	0.0
72	1	REJECTED			HOFFMAN	0.0
73	1	WITHDRAWN		HRS	COLE	100.0

STATUS OF PROPOSALS AS OF 09/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
74	1	COMPLETE		EPICS	PEREZ-MENDO V. STETZ A.W.	350.0 0.0
75	1	IN ERROR				0.0
76	1	COMPLETE	CMR	S4C	CHANG C.Y. KANE J.R.	0.0 0.0
77	1	WITHDRAWN		EPICS	THIESSEN H.A.	120.0
78	1	WITHDRAWN		BTOMED LEP	PHILLIPS G.C.	50.0 50.0
79	1	COMPLETE	EXP-AR-DEV	LEP P3	PHILLIPS G.C.	50.0 50.0
80	1	COMPLETE		P3	PHILLIPS G.C.	300.0
	2	COMPLETE		P3		320.0
81	1	COMPLETE		EPB	PHILLIPS G.C.	200.0
	2	COMPLETE		EPB		420.0
82	1	COMPLETE		P3	PHILLIPS G.C.	400.0
83	1	INACTIVE		BTOMED	PHILLIPS G.C.	100.0
84	1	COMPLETE	FOR PION	BTOMED	PHILLIPS G.C.	50.0
85	1	COMPLETE		S4C	WELSH R.E.	150.0
86	1	COMPLETE		TTA	POSKANZER A.M.	300.0
	2	COMPLETE		TTA		0.0
	3	COMPLETE		TTA		1500.0
87	1	COMPLETE		EPICS	MCCARTHY J.S.	300.0
88	1	REJECTED			SHIVELY F.T.	0.0
89	1	REJECTED		EPICS	BARNES P.D.	300.0
90	1	COMPLETE		P3	SHERMAN R.H.	300.0
	2	COMPLETE		P3	SHIVELY F.T.	400.0
					GLODIS P.F.	0.0
					SPENCER J.E.	0.0
					WADLINGER A.	0.0
					NEEKENS B.M.K.	0.0
91	1	REJECTED		P3	HADDICK R.P.	0.0
92	1	WITHDRAWN		EPB	MAGLIC B.C.	0.0
93	1	WITHDRAWN		P3	PLENDL H.S.	150.0
					GREENFIELD M.B.	0.0
94	1	INACTIVE	PARASITE-Q		LEE Y-K	0.0
95	1	REPLACED	BY 133			0.0
96	1	COMPLETE		LEP	NAGLE D.E.	150.0
	2	COMPLETE		LEP		300.0
97	1	COMPLETE		S4C	WU C.S.	32.0
					HUGHES V.W.	0.0
					DUGAN G.	0.0
					EGAN P.D.	0.0
					LU D.C.	0.0
98	1	REPLACED	BY 133		SPENCER J.E.	0.0
99	1	COMPLETE		P3	REBKA G.A.	250.0
	2	COMPLETE		P3	GRAM P.A.M.	275.0
100	1	COMPLETE		S4C	HUTSON R.L.	100.0
	2	COMPLETE		S4C		170.0
101	F-S	COMPLETE	11/69/155	S4C	BOHEM F.	0.0
					LU D.C.	0.0
102	1	COMPLETE		P3	MARKOWITZ S.S.	30.0
				LEP		0.0
103	1	COMPLETE		P3	HODIS J.	50.0
	2	COMPLETE		AB-NUCCHEM		10.0
				P3		70.0
104	1	COMPLETE	6H-D-SHPI	P3	PATE B.D.	6.0
				AB-NUCCHEM		6.0
	2	COMPLETE		AB-NUCCHEM		10.0
				P3		10.0
105	1	COMPLETE		AB-NUCCHEM	BUNKER M.E.	50.0
				SWY-LABS		0.0
	2	COMPLETE		AB-NUCCHEM		75.0

STATUS OF PROPOSALS AS OF 80/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS	
106	1	COMPLETE		AB-NUCCHEM	GARRIEN	H.A.	20.0
	2	APPROVED		AB-NUCCHEM			20.0
107	1	REPLACED	BY 134		RYAN	V.A.	0.0
108	1	WITHDRAWN			PLENDL	H.S.	0.0
109	1	WITHDRAWN		HRS	FLYNN	E.R.	250.0
110	1	WITHDRAWN		P3	STIMON	M.G.	50.0
111	1	COMPLETE		ASA-RAD	HILL	J.C.	150.0
	2	COMPLETE		BSA-RAD			150.0
112	1	WITHDRAWN			PETERSON	R.J.	0.0
113	1	RESUBMIT		BSA-RAD	MICHEL	D.J.	0.0
114	1	WITHDRAWN			KNAPP	E.A.	0.0
115	1	WITHDRAWN		SMC	WOLFSBERG	K.	70.0
116	1	WITHDRAWN			COOK	B.C.	0.0
117	1	COMPLETE		HRS	IGI	G.J.	120.0
118	1	COMPLETE		AB-NUCCHEM	PORTLE	N.T.	5.0
				P3			20.0
				SWY-LAB			0.0
	2			P3			50.0
	2	COMPLETE		AB-NUCCHEM			0.0
119	1	COMPLETE		P3	KAUFMAN	S.B.	67.0
	2	COMPLETE		P3			32.0
				AB-NUCCHEM			0.0
120	1	COMPLETE	WITH 58	P3	NEFKENS	B.M.K.	480.0
	2	APPROVED		P3	FITZGERALD	D.H.	900.0
121	1	COMPLETE		LEP	SEGEL	R.E.	120.0
				P3			0.0
	2	COMPLETE		P3			62.0
				LEP			112.0
122	1	COMPLETE		LEP	KINSELMAN	A.R.	50.0
	2	COMPLETE		SMC			40.0
123	1	COMPLETE		AB-NUCCHEM	KAROL	P.J.	1.0
				P3			50.0
	2	COMPLETE		AB-NUCCHEM			2.0
				P3			80.0
				P3			0.0
	4	COMPLETE		P3			24.0
124	1	COMPLETE	BY ROSEN	AR	DIETERLE	B.D.	24.0
	2	COMPLETE		EPB	MC FARLANE	M.K.	200.0
	3	APPROVED		EPB			400.0
125	1	COMPLETE		AB	DIETERLE	B.D.	200.0
126	1	REJECTED			BRYANT	H.C.	0.0
127	1	REJECTED			REICH	C.W.	0.0
128	1	COMPLETE	ACCEL-DEV	EPB	HAYWARD	T.D.	0.0
129	1	COMPLETE		AB	WOLFE	D.M.	400.0
130	1	COMPLETE		EPICS	THIESSEN	H.A.	0.0
	2	COMPLETE		EPICS			0.0
131	1	COMPLETE		LEP	FREEDOM	B.M.	125.0
	2	COMPLETE		LEP			216.0
132	1	WITHDRAWN	WITH 160	P3	HWANG	C.F.	250.0
133	1	COMPLETE		EPICS	GEMMELL	D.S.	150.0
134	1	REPLACED	BY 147		RYAN	V.A.	0.0
135	1	REJECTED			MADEY	R.	0.0
136	1	INACTIVE		EPICS	BURLESON	G.R.	0.0
137	1	COMPLETE		EPB	NAGLE	D.E.	500.0
	2	COMPLETE		EPB	MISCHKE	R.E.	700.0
	3	COMPLETE		EPB	FRAUENFELD	H.	330.0
138	1	COMPLETE		HRS	MC DANIELS	D.K.	150.0
					SWENSON	L.W.	0.0
139	1	COMPLETE	TIME-30	HRS	SPENCER	J.E.	250.0
					TANAKA	N.	0.0
140	1	COMPLETE	WITH 180	LEP	HARNES	P.D.	50.0
	2	COMPLETE		LEP			112.0
	3	COMPLETE		LEP			360.0

STATUS OF PROPOSALS AS OF 9/30/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPEAKSMAN	PAC-HRS
141	1	WITHDRAWN			HARGROVE C.K.	0.0
142	1	COMPLETE		SNC	HUIZENGA J.R.	100.0
	2	COMPLETE		SNC		400.0
143	1	COMPLETE		BIONED	KLIGERMAN M.M.	0.0
	2	COMPLETE		BIONED	KNAPP E.A.	0.0
	3	COMPLETE		BIONED		0.0
144	1	COMPLETE		LEP	HIGHLAND V.L.	224.0
	2	COMPLETE		P3	MACEK R.J.	336.0
145	1	WITHDRAWN		EPICS	TAMAS G.	0.0
					LAGET J.-M.	0.0
146	1	WITHDRAWN		EPICS	PETERSON R.J.	0.0
147	1	INACTIVE		BSA-RAD	PERRY D.G.	200.0
					BARR D.W.	0.0
148	1	COMPLETE		NEUTRINO-A	REYNES F.	0.0
	2	COMPLETE	NULL	NEUTRINO-A	CHEN H.H.	0.0
149	1	INACTIVE	PARASITE	SNC	CHEN J.R.	0.0
					SWENSON L.W.	0.0
150	1	COMPLETE		AB-NUCCHEM	THURKEVICH A.L.	100.0
	2	COMPLETE		AB-NUCCHEM		60.0
151	1	COMPLETE		BIONED	KNOWLES H.B.	10.0
152	1	WITHDRAWN		SNC	DIXIT M.S.	150.0
153	1	COMPLETE		EPB	EISENSTEIN R.A.	50.0
				P3		50.0
154	1	COMPLETE		P3	MYNEHART R.C.	360.0
	2	APPROVED		P3	MCCARTHY J.S.	300.0
155	F-5	APPROVED	11/69/101	SNC	LU D.C.	0.0
	1	WITHDRAWN		SNC		300.0
156	1	COMPLETE	PARASITE	EPICS	SWENSON L.W.	0.0
157	1	APPROVED		BSA-RAD	SEITZ M.G.	25.0
158	1	INACTIVE	PARASITE	HRS	IGY G.J.	0.0
159	1	COMPLETE	PARASITE	EPB	EISENSTEIN R.A.	0.0
160	1	WITHDRAWN	WITH 132	EPB	HWANG C.F.	100.0
	2	DEFER		EPB		0.0
161	1	COMPLETE	WITH 157	BSA-RAD	HAINES E.L.	160.0
162	1	COMPLETE		LEP	YAVIN A.I.	50.0
					ALSTER J.	0.0
163	1	COMPLETE		SNC	PERKINS R.B.	100.0
					SHERA E.B.	0.0
164	1	COMPLETE		LEP	FISHER T.R.	80.0
					MARSHAK M.	0.0
165	1	COMPLETE		SNC	HUGHES V.W.	50.0
166	1	COMPLETE		SNC	POWERS R.J.	120.0
167	1	COMPLETE	FEAS/PARA	BIONED	ZIOCK K.D.H.	0.0
168	1	WITHDRAWN	2-SREL	BIONED	ZIOCK K.D.H.	0.0
169	1	COMPLETE		AB-NUCCHEM	ORTH C.J.	0.0
					SATTIZAHN J.E.	0.0
170	1	COMPLETE		LEP	ALSTER J.	50.0
171	1	APPROVED		BIONED	BENTON E.V.	14.0
172	1	INACTIVE		SNC	SMALLON E.	0.0
173	1	COMPLETE		SNC	BOEHM F.	300.0
	2	COMPLETE		SNC	VOGEL P.	300.0
174	1	COMPLETE		BSA-RAD	ROMLAND F.S.	200.0
	2	COMPLETE		BSA-RAD	MILLER G.E.	80.0
175	1	COMPLETE		SNC	HUGHES V.W.	0.0
176	1	COMPLETE		EPB	ANDERSON B.D.	200.0
	2	COMPLETE		EPB		200.0
177	1	INACTIVE		HRS	IGY G.J.	0.0
					BAUER T.S.	0.0
178	1	COMPLETE	IN PRIN.	HRS	SPENCER J.E.	150.0
					HINTZ M.M.	0.0
179	1	COMPLETE	DETEC/DEV	LINE-B	ROTHMAN J.D.	0.0
180	1	COMPLETE		LEP	EISENSTEIN R.A.	50.0
	2	COMPLETE		LEP		280.0

STATUS OF PROPOSALS AS OF 90/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
181	1	COMPLETE		LEP	ALSTER J.	112.0
	2	COMPLETE		LEP	BOWMAN J.D.	0.0
				P3		0.0
182	1	REJECTED		LEP	PETERSON R.J.	0.0
183	1	COMPLETE	TM PRINCIP	HRS	HINTZ N.M.	250.0
					SPENCER J.E.	0.0
184	1	COMPLETE		ISORAD	GRIEN H.A.	0.0
				LINE-X-MS		0.0
185	1	INACTIVE		AS	SIMMONS J.E.	0.0
186	1	WITHDRAWN		EPB	PETERSON R.J.	0.0
187	1	APPROVED	PARASITE	BIOMED	REIDY J.J.	0.0
188	1	INACTIVE		BIOMED	CARLSON D.E.	50.0
189	1	COMPLETE		AS	VANDYCK D.B.	296.0
190	1	APPROVED	PARASITE	LEP	7IDCK K.D.H.	200.0
191	1	COMPLETE		LEP	HALPERN I.	112.0
	2	COMPLETE		LEP		165.0
	3	COMPLETE	BY ROSEN	LEP		200.0
	4	COMPLETE		LEP		190.0
192	1	COMPLETE	ACCEL-DEV.	EPB	HAYWARD T.D.	45.0
193	1	COMPLETE		AS	DIETERLE B.D.	250.0
	2	COMPLETE		AS	MC FARLANE W.K.	0.0
194	1	COMPLETE		EPB	BEVINGTON P.R.	400.0
	2	APPROVED		EPB		200.0
195	1	COMPLETE		BIOMED	LEON M.	0.0
	2	COMPLETE		P3	REIDY J.J.	100.0
				BIOMED		0.0
	3	COMPLETE		P3		168.0
196	1	COMPLETE		BIOMED	DANIEL H.	0.0
					REIDY J.J.	0.0
197	1	COMPLETE		EPB	HUNGERFORD E.V.	225.0
198	1	COMPLETE		BIOMED	POWERS G.E.	0.0
199	1	WITHDRAWN			BARRETT R.J.	0.0
200	1	COMPLETE	ACCEL DEV	EPB	BRYANT H.C.	0.0
201	1	COMPLETE		P3	MINEHART R.C.	250.0
202	1	APPRV/CONF	FEAST/J/650	HRS	IGD G.J.	0.0
203	1	REJECTED			PHILLIPS G.C.	0.0
204	1	COMPLETE		HRS	IGN G.J.	100.0
205	1	COMPLETE	LIT PART	AS	KENEFFICK R.A.	50.0
					RILEY P.J.	0.0
206	1	COMPLETE		SMC	HUGHES V.W.	250.0
					EGAN P.D.	0.0
207	1	COMPLETE		BIOMED	BRADBURY J.N.	0.0
					ALLRED J.C.	0.0
208	1	WITHDRAWN		AS	NORTHCLIFF L.C.	200.0
209	1	COMPLETE		BIOMED	BRADBURY J.N.	0.0
				LEP	ALLRED J.C.	0.0
210	1	COMPLETE		ISORAD	GRIEN H.A.	0.0
211	1	COMPLETE		ISORAD	GREEN W.V.	0.0
212	1	COMPLETE		BIOMED	HEWITTEN D.J.	16.0
213	1	COMPLETE	AFTER TEST	SMC	SHERA E.B.	32.0
					STEFFEN R.M.	0.0
214	1	COMPLETE	W/195	P3	HARGROVE C.K.	60.0
					LEON M.	0.0
215	1	APPROVED		BIOMED	PEREZ-MEND V.	104.0
					BRADBURY J.N.	0.0
216	1	REJECTED			WADLINGER A.	0.0
217	1	APPROVED		BIOMED	PACIOTTI M.A.	32.0
218	1	APPROVED		BIOMED	KATZ R.	16.0
219	1	COMPLETE		EPB	BEVINGTON P.R.	225.0
220	1	REJECTED			HOFFMANN G.W.	0.0
					MOORE C.F.	0.0
221	1	COMPLETE		P3	HOFFMAN C.M.	500.0
222	1	COMPLETE		P3	MISCHKE R.E.	500.0

STATUS OF PROPOSALS AS OF 9/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
223	F-S	COMPLETE	PARASITE	HRS	HOFFMANN G.W.	0.0
	F-S	COMPLETE		EPB		0.0
224	1	WITHDRAWN		EPICS	ENSSLIN N.	0.0
					MADLAND D.G.	0.0
					MORRIS C.L.	0.0
225	1	APPROVED		NEUTRINO-A	CHEN H.H.	0.0
					RETNES F.	0.0
226	1	REJECTED			BIRLESON G.R.	0.0
227	1	INACTIVE	PARASITE	HRS	RILEY P.J.	0.0
					SPENCER J.E.	0.0
228	1	WITHDRAWN				0.0
229	1	COMPLETE		EPICS	BRAITHWAIT W.J.	200.0
					MOTRE C.F.	0.0
230	1	WITHDRAWN			BRAITHWAIT W.J.	0.0
					THIESSEN H.A.	0.0
					MOTRE C.F.	0.0
231	1	WITHDRAWN		EPICS	BRAITHWAIT W.J.	0.0
					MOTRE C.F.	0.0
232	1	INACTIVE		EPICS	MADLAND D.G.	0.0
					MORRIS C.L.	0.0
					THIESSEN H.A.	0.0
233	1	APPROVED	W/10	HRS	SETH K.K.	140.0
					SPENCER J.E.	0.0
234	1	COMPLETE		LEP	GOTOW K.	0.0
235	1	APPROVED		BIOMED	GILLETTE E.L.	21.0
236	1	APPROVED		BIOMED	RAJJI M.R.	280.0
237	1	RESUBMIT		BSA-RAD	HOLLAND J.R.	0.0
					GREEN W.V.	0.0
238	1	REPLACED	BY 293		MADEY R.	0.0
239	1	COMPLETE		BIOMED	FRIENLAND S.S.	28.0
	2	COMPLETE		BIOMED	MAUSNER L.F.	0.0
240	1	COMPLETE	0	SMC	SHERA E.B.	240.0
					WOHLFAHRT H.D.	0.0
241	1	COMPLETE		EPB	HOFFMAN C.M.	0.0
					MISCHKE R.E.	0.0
242	1	COMPLETE		BIOMED	TODD P.	64.0
243	1	COMPLETE		AB-MUCCHEN	PORTLE N.T.	140.0
244	1	FUR-CONST		BIOMED	BRILL A.B.	0.0
245	1	COMPLETE		EPICS	KALLNE J.	450.0
					THIESSEN H.A.	0.0
246	1	COMPLETE		EPICS	EISENSTEIN R.A.	450.0
247	1	COMPLETE		LEP	ORTH C.J.	72.0
	2	COMPLETE		P3		0.0
				LEP		0.0
248	1	COMPLETE		P3	KALLNE J.	480.0
					MCCARTHY J.S.	0.0
					GUGELDT P.C.	0.0
249	1	APPROVED		HRS	WHITTEN C.A.	100.0
250	1	REJECTED		SMC	REIDY J.J.	0.0
					MUTSON R.L.	0.0
251	1	WITHDRAWN		BSA-RAD	MITCHELL J.B.	0.0
					PARKIN D.M.	0.0
252	1	ABSORBED	INTO 265	EPICS	KRAUSHAAR J.J.	0.0
253	1	WITHDRAWN		ISORAD	GOLAND A.N.	0.0
					PARKIN D.M.	0.0
254	1	COMPLETE	FEAS STUDY	NEUTRINO-A	FIREMAN E.L.	0.0
255	1	COMPLETE		AB	NORTHCLIFF L.C.	0.0
256	1	COMPLETE		HRS	FRANKEL S.	100.0
257	1	INACTIVE	PARASITE	HRS	FRANKEL S.	0.0
258	1	COMPLETE		HRS	FRANKEL S.	150.0
	2	REJECTED		HRS	FRATTI W.	0.0
259	1	REJECTED		SMC	REIDY J.J.	0.0

STATUS OF PROPOSALS AS OF 80/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
260	1	REJECTED		HRS	HOFFMANN G.W. COCKER W.R. IGD G.J.	0.0 0.0 0.0
261	1	COMPLETE		HRS	RTCKEY M.E. SHEPARD J.R. PETERSON R.J.	0.0 0.0 0.0
262	1	COMPLETE		AB	BONNER B.E.	112.0
263	1	COMPLETE		AB	BONNER B.E.	150.0
264	1	COMPLETE		AB	BONNER B.E.	216.0
265	1	COMPLETE	PARASITE	EPICS	MORRIS C.L. BRAITHWAIT W.J.	225.0 0.0
266	1	COMPLETE	WITH 297	SMC	GAUSTER W.B.	109.0
	2	APPROVED		SMC	HEFFNER R.H.	210.0
	3	APPROVED		SMC		135.0
267	1	APPROVED		ISORAD	O'BRIEN H.A.	0.0
268	1	COMPLETE		SMC	SOUDE P.A. HUGHES V.W.	42.0 0.0
269	1	COMPLETE	BY RTSEN	SWY-LABS	GREEN W.V.	30.0
270	1	APPROVED		BIDMED	PACINOTTE M.A.	512.0
271	1	APPROVED		BIDMED	SMITH A.R.	900.0
272	1	APPROVED		BIDMED	DICELLO J.F.	144.0
273	1	APPROVED		BIDMED	RICHMAN C.	536.0
274	1	APPROVED		BIDMED	BUSH S.	700.0
275	1	APPROVED		BIDMED	BUSH S.	1500.0
276	1	COMPLETE		SMC	YAMAZAKI T.	60.0
	2	COMPLETE		SMC		200.0
	3	COMPLETE		SMC		264.0
277	1	COMPLETE	PARASITE	SMC	ALLRED J.C.	80.0
278	1	COMPLETE		EPB	HOFFMANN G.W. MORE C.F.	24.0 0.0
279	F-S	COMPLETE	FEAS STUDY	AB	DIETERLE B.D.	72.0
	1	COMPLETE		EPB	MC FARLANE W.K.	0.0
280	1	WITHDRAWN		EPB		0.0
281	1	WITHDRAWN		HRS	NEFKENS B.M.K.	0.0
				SMC	HUANG C.Y. ROSENBLUM S.S.	0.0 0.0
282	1	COMPLETE		AB-NUCCHEN	DONNERT H.J.	20.0
	2	COMPLETE		AB-NUCCHEN		0.0
	3			AB-NUCCHEN		0.0
283	1	COMPLETE		SMC	KRANE K.S.	100.0
				P3	SHARMA T.C.	0.0
284	2	COMPLETE	CONDITIONAL	SMC		60.0
	1	APPROVED		LEP	CONPER M.D. HEFFNER R.H.	266.0 0.0
285	1	COMPLETE		BIDMED	MAUSNER L.F.	0.0
286	1	COMPLETE		P3	HANSON K.M.	320.0
287	1	REJECTED		P3	LIND V.G.	0.0
288	1	COMPLETE		SMC	NAUMANN R.A.	150.0
289	1	COMPLETE	CONDITIONAL	EPB	WHITTEN C.A.	100.0
290	1	WITHDRAWN		BSA-RAD	MADEY R. GREEN W.V. VEESER L.R.	0.0 0.0 0.0
291	1	WITHDRAWN		EPICS	SWENSON L.W. MORE C.F.	300.0 0.0
292	1	COMPLETE		SMC	HUIZENGA J.R.	160.0
	2	COMPLETE		SMC		120.0
293	1	COMPLETE		LEP	SEGEL R.E.	112.0
294	1	APPROVED		AB-NUCCHEN	KAROL P.J.	50.0
295	1	APPROVED		LEP	BOWMAN J.D.	300.0
					WINNESTER M.A.	0.0
296	1	WITHDRAWN		EPB	BAER H.W. BOWMAN J.D.	0.0 0.0

STATUS OF PROPOSALS AS OF 05/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS	
297	1	COMPLETE	WITH 366	SMC	BROWN	J.A.	109.0
	2	COMPLETE		SMC			210.0
	3	COMPLETE		SMC			135.0
298	1	COMPLETE		NULL	SELVE	W.	0.0
299	1	COMPLETE		LEP	ZIOCK	K.O.H.	224.0
	2	COMPLETE		LEP			220.0
	3	APPROVED		LEP			300.0
300	1	COMPLETE		BIMED	DANIEL	H.	0.0
					LEON	M.	0.0
301	1	APPROVED		AB-NUCCHEM	WILSON	M.T.	0.0
302	1	COMPLETE		RADAMAGE-1	GREEN	W.V.	0.0
				PIP			0.0
303	1	COMPLETE		LEP	JACKSON	H.E.	0.0
	2	COMPLETE		LEP			200.0
	3	APPROVED		LEP			240.0
304	1	COMPLETE	SCT-MERIT	BIMED	LEON	M.	0.0
				P3	MAUSNER	L.F.	0.0
305	1	WITHDRAWN	FEAS STUDY	SMC	DENISON	A.B.	100.0
					HEFFNER	R.H.	0.0
					HUANG	C.Y.	0.0
306	1	REJECTED		HRS	IGN	G.J.	0.0
307	1	INACTIVE		HRS	IGN	G.J.	0.0
					WHITTEN	C.A.	0.0
308	1	APPROVED		TTA	BUTLER	G.W.	0.0
					POSKANZER	A.M.	0.0
309	1	APPROVED		P3	REBKA	G.A.	500.0
310	1	COMPLETE		EPICS	BRAITHWAIT	W.J.	200.0
					MORRIS	C.L.	0.0
311	1	COMPLETE		HRS	HOFFMANN	G.W.	500.0
	2	COMPLETE		HRS			100.0
312	1	REJECTED		SMC	HUTSON	R.L.	0.0
313	1	WITHDRAWN		SMC	HUANG	C.Y.	88.0
314	1	REJECTED		SMC	HUWE	S.D.	0.0
					DONNERT	H.J.	0.0
315	1	COMPLETE		LEP	WHARTON	W.P.	360.0
	2	COMPLETE		LEP			300.0
	3	APPROVED		LEP			500.0
316	1	COMPLETE		LEP	SETH	K.K.	360.0
	2	APPROVED		LEP	BURLESON	G.R.	240.0
317	1	COMPLETE	COMB/W 368	EPICS	PETERSON	R.J.	0.0
318	1	WITHDRAWN		LEP	AMANN	J.F.	0.0
	2	WITHDRAWN		EPICS	CRAIG	J.N.	0.0
					SHERMAN	J.D.	0.0
319	1	COMPLETE		P3	LIND	V.G.	80.0
320	1	COMPLETE		P3	CHURCH	L.B.	50.0
	2	COMPLETE		P3			100.0
	3	COMPLETE		LEP			24.0
321	1	WITHDRAWN		EPB	COLE	R.K.	0.0
322	1	COMPLETE		LEP	BERTRAND	F.E.	360.0
					GOTOW	K.	0.0
323	1	COMPLETE		EPB	BRYANT	H.C.	110.0
					GRAM	P.A.M.	0.0
324	1	COMPLETE		LEP	HALPERN	I.	50.0
325	1	COMPLETE	PARASITE	EPICS	HANSON	K.M.	0.0
326	1	APPROVED	PARASITE	BSA-RAD	HARVEY	A.	0.0
				AB-NUCCHEM			0.0
327	1	COMPLETE		PIP	WILSON	M.T.	0.0
328	1	COMPLETE	D	SMC	BOWMAN	J.D.	1020.0
					COOPER	M.D.	0.0
329	1	WITHDRAWN	FEAS STUDY	SMC	THOMPSON	P.A.	150.0
					FRANKEL	S.	0.0
					HUGHES	V.W.	0.0

STATUS OF PROPOSALS AS OF 90/10/15.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
330	1	COMPLETE	CONDITIONAL	SMC	HUTSON R.L.	128.0
	2	COMPLETE		SMC	YATES-WILL M.A.	48.0
331	1	COMPLETE		SMC	ORTH C.J.	84.0
	2	COMPLETE		SMC		42.0
332	1	WITHDRAWN		EPICS	SETH K.K.	0.0
333	1	COMPLETE		LEP	GOTOW K.	360.0
334	1	COMPLETE	IN PART	SMC	SHERA E.B.	115.0
	2	APPROVED		SMC	WUHLFAHRT H.D.	144.0
335	1	COMPLETE		SMC	SHERA E.B.	210.0
					YAMAZAKI Y.	0.0
336	1	COMPLETE	W/33	EPB	MUTCHLER G.S.	450.0
	2	APPROVED		EPB	PINSKY L.S.	120.0
	3	DEFER		EPB		0.0
337	1	COMPLETE		P3	REKA G.A.	600.0
					GRAM P.A.M.	0.0
338	1	WITHDRAWN		EPICS	BRAITHWAIT W.J.	0.0
339	1	COMPLETE		EPB	BRYANT H.C.	504.0
					GRAM P.A.M.	0.0
340	1	WITHDRAWN		EPICS	FISHER T.R.	0.0
					MARSHAK H.	0.0
341	1	COMPLETE		EPB	PHILLIPS G.C.	170.0
342	1	COMPLETE	COMB/W 39	EPICS	MCCARTHY J.S.	175.0
					KALLNE J.	0.0
343	1	REJECTED		HRS	SETH K.K.	3.0
344	1	COMPLETE		SMC	HUGHES V.W.	400.0
345	1	APPROVED		HRS	FRANKEL S.	0.0
					FRATI W.	0.0
					VANDYCK D.B.	0.0
346	1	COMPLETE		HRS	FRANKEL S.	150.0
347	1	COMPLETE		HRS	HINTZ N.M.	150.0
348	1	COMPLETE		LEP	CROWE K.M.	500.0
349	1	COMPLETE		P3	PORTLE N.T.	173.0
	2	APPROVED		LEP		16.0
350	1	COMPLETE		LEP	SEGEL R.E.	144.0
					SCHIFFER J.P.	0.0
351	1	REJECTED		HRS	IGO G.J.	0.0
352	1	COMPLETE	W/355	HRS	WHITTEN C.A.	100.0
353	1	REJECTED		HRS	SETH K.K.	0.0
354	1	COMPLETE		HRS	BLANPTE G.S.	100.0
355	1	COMPLETE	W/352	HRS	HOFFMANN G.W.	100.0
	2	COMPLETE	W/352	HRS		60.0
356	1	COMPLETE	CONDITIONAL	HRS	GLASHAUSSE C.	0.0
	2	APPROVED		HRS	BAKER F.T.	75.0
					SCOTT A.	0.0
357	1	COMPLETE		SMC	KNIGHT J.D.	120.0
358	1	COMPLETE		P3	MINEHART R.C.	450.0
359	1	REJECTED		HRS	BAUER T.S.	0.0
360	1	COMPLETE		AB	RILEY P.J.	150.0
					SIMMONS J.E.	0.0
361	1	REJECTED		HRS	ADAMS G.S.	0.0
362	1	WITHDRAWN	CONDITIONAL	HRS	BAUER T.S.	0.0
					WRIEKAT A.	0.0
363	1	COMPLETE		P3	SADLER M.E.	550.0
	2	COMPLETE		P3	NEFKENS B.M.K.	0.0
364	1	COMPLETE		SMC	EGAN P.D.	300.0
	2	COMPLETE		SMC	DENISON A.B.	120.0
					HUGHES V.W.	0.0
365	1	REJECTED		HRS	HINTZ N.M.	0.0
366	1	COMPLETE		AB	MAYES B.W.	400.0
					MUTCHLER G.S.	0.0
367	1	REJECTED		HRS	NANN H.	0.0
					SETH K.K.	0.0
368	1	COMPLETE	COMB/W 317	EPICS	MOORE C.F.	300.0

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
369	1	APPROVED	CONDITIONAL	EPICS	DEHWARD	200.0
370	1	REJECTED		LEP	CRAHER	0.0
371	1	APPROVED		SHC	HUTSON	120.0
372	1	REJECTED		LEP	EDGE	0.0
373	1	COMPLETE		P3	REIDY	160.0
374	1	COMPLETE		SHC	SCHILLACI	0.0
375	1	COMPLETE		SHC	SCHILLACI	144.0
376	1	REJECTED		SHC	PAULETTA	210.0
377	1	COMPLETE		SHC	REIDY	24.0
379	1	REJECTED		SHC	HARVEY	0.0
379	1	WITHDRAWN		P3	ROSENBLUM	80.0
380	1	APPROVED		BIDMED	PHILLIPS	60.0
381	1	COMPLETE		SWY-LARS	GOLDSTEIN	0.0
382	1	APPROVED		SHC	KOSSLER	300.0
383	1	REJECTED		ISORAD	HARVEY	0.0
384	1	REJECTED		AB-NUCHEM	A.	0.0
384	1	APPROVED		BIDMED	GERACI	24.0
385	1	COMPLETE		HRS	HOFFMANN	100.0
386	1	COMPLETE		HRS	HOFFMANN	200.0
387	1	APPROVED		A3	BUNNER	400.0
388	1	COMPLETE		LEP	HOLT	250.0
389	1	COMPLETE		EPICS	MORRISON	300.0
390	1	COMPLETE		P3	JACKSON	360.0
391	1	COMPLETE		EPICS	PETERSON	300.0
392	1	APPROVED		HRS	HOFFMANN	324.0
393	1	APPROVED		LEP	ALSTER	266.0
394	1	COMPLETE		P3	HANSON	250.0
395	1	COMPLETE		HRS	BAUER	200.0
396	1	COMPLETE		P3	REIDY	60.0
397	1	REJECTED		HRS	IGT	0.0
398	1	REJECTED		HRS	THIESSEN	0.0
399	1	APPROVED		HRS	BERTRAND	0.0
400	1	APPRV/CM9	W/445	SHC	DUNG-VAN	1000.0
401	1	APPROVED		LEP	HOFFMAN	0.0
402	1	COMPLETE	FEAS STUDY	AH	GLASS	50.0
403	2	COMPLETE		AB	SIMONS	120.0
403	1	COMPLETE		AB	BUNNER	165.0
404	1	COMPLETE		P3	HAMM	180.0
405	1	APPROVED		HRS	SWENSON	180.0
406	1	APPROVED		BSA-RAD	HARVEY	0.0

STATUS OF PROPOSALS AS OF 90/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
407	1	COMPLETE		AB-NUCCHEM	SOMMER W.F.	480.0
	2	APPROVED		AB-NUCCHEM		520.0
408	1	APPROVED		SMC	HEFFNER R.H.	150.0
					LEON M.	0.0
409	1	REJECTED		P3	LIND V.G.	0.0
					GREENFIELD N.B.	0.0
410	1	COMPLETE	BY ROSEN	AB-NUCCHEM	COST J.R.	0.0
411	1	APPROVED		HRS	HINTZ N.M.	240.0
					MOSS J.M.	0.0
412	1	APPROVED		LEP	BAER H.W.	266.0
					BOWMAN J.D.	0.0
					OVERNA F.H.	0.0
413	1	COMPLETE		EPICS	SETH K.K.	0.0
					NANN H.	0.0
414	1	APPROVED		SMC	HUTSON R.L.	64.0
					REIDY J.J.	0.0
415	1	COMPLETE		LEP	ORTH C.J.	65.0
				BSA-RAD		0.0
416	1	COMPLETE		P3	DRUPESKY B.J.	106.0
	2	COMPLETE		P3		36.0
417	1	COMPLETE		SMC	HUTZENGA J.R.	180.0
418	1	REJECTED		P3	LIND V.G.	0.0
419	1	COMPLETE	FEAS STUDY	EPICS	BRAITHWAIT W.J.	24.0
					MORRIS C.L.	0.0
					MORRE C.F.	0.0
420	1	DEFER		P3	GRUHN C.R.	80.0
					FLYNN E.R.	0.0
421	1	APPROVED		SMC	SQUIDER P.A.	850.0
					FRANKEL S.	0.0
					HUGHES V.W.	0.0
422	1	RESUBMIT		SMC	LU D.C.	0.0
423	1	WITHDRAWN		EPICS	MORRIS C.L.	0.0
					MORRE C.F.	0.0
424	1	COMPLETE		AB-NUCCHEM	TURKEVICH A.L.	0.0
					WARREN J.	0.0
425	1	APPRV/COMB	W/433	HRS	SETH K.K.	200.0
					HOFFMANN G.W.	0.0
426	1	REJECTED		EPICS	SETH K.K.	0.0
427	1	COMPLETE	FEAS STUDY	SMC	ESTLE T.L.	196.0
	2	APPROVED		SMC	HEFFNER R.H.	200.0
	3	APPROVED		SMC		150.0
428	1	WITHDRAWN	BY ROSEN	HRS	IGD G.J.	0.0
429	1	WITHDRAWN		P3	ZIOCK K.D.H.	120.0
430	1	REJECTED		SMC	ZIOCK K.D.H.	0.0
431	1	COMPLETE		HRS	GLASHAUSSE C.	175.0
					MOSS J.M.	0.0
432	1	APPROVED		HRS	GLASHAUSSE C.	100.0
					MOSS J.M.	0.0
433	1	APPRV/COMB	W/429	HRS	HOFFMANN G.W.	0.0
					SETH K.K.	0.0
434	1	REJECTED		HRS	HOTSTAD B.	0.0
					ADAMS G.S.	0.0
					NANN H.	0.0
435	1	WITHDRAWN		SMC	CROWE K.M.	64.0
					KOHN S.E.	0.0
436	1	COMPLETE		SMC	YAMAZAKI T.	160.0
					HAYANO R.	0.0
437	1	WITHDRAWN	FEAS STUDY	P3	JACKSON H.E.	120.0
438	1	APPROVED		HRS	IGD G.J.	200.0
439	1	APPROVED		P3	LIND V.G.	180.0
440	1	REJECTED		AB	DIETERLE B.D.	0.0
					DONAHUE J.B.	0.0
441	1	INACTIVE		LEP	ADAMS G.S.	160.0

STATUS OF PROPOSALS AS OF 03/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
442	1	COMPLETE		EPICS	KALLME J.	100.0
443	1	REJECTED		HRS	HOISTAD B.	0.0
444	1	APPROVED		SMC	BOWMAN J.D.	1000.0
					HOFFSTADTER R.	0.0
445	1	APPRV/CMRB	W/400	SMC	MATIS H.S.	0.0
					BOWMAN J.D.	0.0
446	1	APPROVED		EPICS	HALBERN I.	72.0
					EISENSTEIN R.A.	0.0
					THIESSEN H.A.	0.0
447	1	INACTIVE		EPICS	THIESSEN H.A.	200.0
448	1	COMPLETE		EPICS	MURLESON G.R.	300.0
449	1	COMPLETE		EPB	BRYANT H.C.	450.0
	2	APPROVED		EPB	DONAHUE J.B.	150.0
450	1	APPRV/CMRB	FEASTU/202	HRS	WINTZ N.M.	0.0
451	1	APPROVED		HRS	WINTZ N.M.	200.0
452	1	COMPLETE		EPICS	DEHNHARD D.	240.0
453	1	REJECTED		P3	CROWE K.M.	0.0
454	1	COMPLETE	FEAS STUDY	SMC	CROWE K.M.	50.0
	2	APPROVED		SMC		150.0
455	1	APPROVED		P3	ANDERSON H.L.	1200.0
456	1	APPROVED		EPICS	HOISTAD B.	230.0
457	1	APPROVED		AB	BHATTIA T.S.	220.0
					SIMMONS J.E.	0.0
458	1	APPROVED		P3	KAUFMAN S.B.	60.0
459	1	COMPLETE		P3	VIEIRA D.J.	72.0
460	1	COMPLETE		EPICS	SETH K.K.	360.0
461	1	REJECTED		HRS	IVERSEN S.G.	0.0
					SETH K.K.	0.0
462	1	APPROVED		HRS	SETH K.K.	100.0
					NANN H.	0.0
463	1	COMPLETE		EPICS	NANN H.	360.0
					SETH K.K.	0.0
464	1	DEFER		SMC	WU C.S.	120.0
					DUGAN G.	0.0
					HUGHES V.W.	0.0
					LU D.C.	0.0
					EGAN P.D.	0.0
465	1	COMPLETE		P3	RUNDBERG R.S.	108.0
				AR-MUCCHEM		0.0
				LEP		0.0
466	1	COMPLETE		P3	FUNSTEN H.D.	180.0
					PLENDL H.S.	0.0
467	1	APPROVED		BSA-RAD	GILMORE J.S.	0.0
468	1	COMPLETE		EPB	BECHER J.	0.0
469	1	DEFER		P3	MCGILL J.	100.0
					HOFFMANN G.W.	0.0
470	1	COMPLETE		HRS	BARLETT M.	150.0
					HOFFMANN G.W.	0.0
471	1	REJECTED		HRS	HOFFMANN G.W.	70.0
472	1	COMPLETE		HRS	WHITTEN C.A.	70.0
473	1	COMPLETE		HRS	MOSS J.M.	90.0
	2	APPROVED		HRS	ADAMS G.S.	200.0
					CAREY T.A.	0.0
474	1	APPROVED		HRS	CORNELIUS W.D.	130.0
475	1	APPROVED		HRS	BLANPIED G.S.	125.0
476	1	APPROVED		HRS	BLANPIED G.S.	100.0
477	1	REJECTED		HRS	IGD G.J.	0.0
478	1	COMPLETE		EPICS	MASTERSUN T.G.	100.0
479	1	APPROVED		HRS	IGD G.J.	200.0
480	1	APPROVED		P3	ZEIDMAN B.	150.0
481	1	COMPLETE		EPICS	GEESAMAN D.F.	130.0
482	1	REJECTED		EPICS	ZEIDMAN B.	0.0
					GEESAMAN D.F.	0.0

STATUS OF PROPOSALS AS OF 90/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
483	1	COMPLETE		LEP	HOLT R.J.	400.0
484	1	APPROVED	FEAS STUDY	EPICS	MORRIS C.L.	100.0
485	1	APPROVED		HRS	HOLTSTAD B.	200.0
486	1	COMPLETE		HRS	IGO G.J.	100.0
					GLASHAUSSE C.	0.0
					MOSS J.M.	0.0
487	1	APPROVED		LEP	REIDY J.J.	180.0
					LEON M.	0.0
488	1	REJECTED		EPICS	BLANPIED G.S.	150.0
489	1	COMPLETE		HRS	MOSS J.M.	60.0
490	1	DEFER		HRS	PAULETTA G.	0.0
491	1	APPROVED		SMC	BRYET E.	288.0
492	1	APPROVED		EPB	MCAUGHTON M.W.	325.0
					WILLARD H.B.	0.0
493	1	REJECTED		EPICS	HOLTkamp D.B.	0.0
					MOORE C.F.	0.0
494	1	APPROVED		SMC	HEHN M.V.	160.0
495	1	COMPLETE	W/506	EPICS	MORRIS C.L.	400.0
					RAITHWAIT W.J.	0.0
496	1	REJECTED		AB	BONNER B.E.	0.0
					GLASS G.C.	0.0
497	1	REJECTED		HRS	CORNELIUS W.D.	0.0
498	1	APPROVED		EPB	WAGNER R.	650.0
	2	DEFER		EPB	BURLESON G.R.	0.0
	3	DEFER		AB		0.0
499	1	APPROVED		SMC	DOODS S.A.	300.0
					MACLAUGHLI D.E.	0.0
					HEFFNER R.H.	0.0
500	1	APPROVED		P3	RUNDBERG R.S.	90.0
501	1	REJECTED		HRS	PAULETTA G.	0.0
502	1	REJECTED		HRS	PAULETTA G.	0.0
503	1	REJECTED		HRS	SETH K.K.	0.0
504	1	APPROVED		AB	PHILLIPS G.C.	300.0
505	1	APPROVED	ON 504 PARASITE	AB	PHILLIPS G.C.	0.0
506	1	COMPLETE	W/495	EPICS	COTTINGAME W.B.	0.0
					RAITHWAIT W.J.	0.0
507	1	REJECTED		EPICS	KALLNE J.	0.0
508	1	APPROVED		HRS	SETH K.K.	140.0
509	1	REJECTED		EPICS	DEHNHARD D.	0.0
510	1	APPROVED		EPICS	DEHNHARD D.	50.0
	2	APPROVED		EPICS		200.0
511	1	REJECTED		EPICS	GREENE S.J.	0.0
					MOORE C.F.	0.0
512	1	APPROVED		EPB	MCAUGHTON M.W.	500.0
	2	RESUBMIT		EPB	WILLARD H.B.	0.0
	3	DEFER		EPB		0.0
	4	REJECTED		EPB		0.0
513	1	COMPLETE		P3	MCCARTHY J.S.	0.0
	2	APPROVED		P3	WINEHART R.C.	300.0
514	1	APPROVED	FEAS STUDY	SMC	VERGANINI P.J.	50.0
					COOKE D.W.	0.0
					ESTLE T.L.	0.0
515	1	WITHDRAWN	FEAS STUDY	P3	LEON M.	125.0
					REIDY J.J.	0.0
516	1	COMPLETE		EPICS	ANDERSON R.E.	50.0
					HOISTAD B.	0.0
517	1	APPROVED		EPB	SIMMONS J.E.	500.0
					JARMER J.J.	0.0
					NORTHCLIFF L.C.	0.0
518	1	DEFER		EPB	SIMMONS J.E.	0.0
					JARMER J.J.	0.0
					NORTHCLIFF L.C.	0.0

STATUS OF PROPOSALS AS OF 9/19/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
519	1	COMPLETE		HRS	FRANKEL S.	96.0
520	1	APPROVED		HRS	FRANKEL S.	96.0
521	1	REJECTED		HRS	FRANKEL S.	0.0
522	1	COMPLETE		EPICS	KING N.S.P.	150.0
					ANDERSON R.E.	0.0
					PETERSON R.J.	0.0
523	1	APPROVED		LEP	GONNMAN C.D.	100.0
					BAER H.W.	0.0
524	1	APPROVED		LEP	BAER H.W.	200.0
					BOWMAN J.D.	0.0
					COVERNA F.H.	0.0
525	1	APPROVED		LEP	KING N.S.P.	50.0
					WINNESTER M.A.	0.0
526	1	APPROVED		EPB	COVERNA F.H.	250.0
	2	DEFER		EPB	ANDERSON R.E.	0.0
					KING N.S.P.	0.0
527	1	APPROVED		LEP	BAER H.W.	200.0
					BOWMAN J.D.	0.0
528	1	DEFER		AB	SIMMONS J.E.	0.0
					WORTHCLIFF L.C.	0.0
529	1	COMPLETE	FEAS STUDY	SMC	WILL C.S.	100.0
					DUGAN G.	0.0
					HUGHES V.W.	0.0
					LU D.C.	0.0
					EGAN P.D.	0.0
530	1	COMPLETE		EPB	JASON A.J.	0.0
531	1	APPROVED		HRS	GLASHAUSSE C.	150.0
					MOSS J.M.	0.0
532	1	APPROVED		HRS	FRANKEL S.	150.0
533	1	APPROVED		HRS	HOISTAD B.	120.0
					SETH K.K.	0.0
534	1	REJECTED		HRS	PAULETTA G.	0.0
					MCCLELLAND J.B.	0.0
535	1	APPROVED		HRS	ANDERSON R.E.	160.0
					HOISTAD B.	0.0
536	1	COMPLETE		LEP	GUTBERG H.H.	48.0
537	1	REJECTED		EPICS	ANDERSON R.E.	0.0
					HOISTAD B.	0.0
538	1	APPROVED		HRS	SHEPARD J.R.	72.0
	2	APPROVED		HRS	KING N.S.P.	32.0
539	1	APPROVED		EPICS	BAER H.W.	300.0
					HOLTKAMP D.B.	0.0
540	1	APPROVED		HRS	IGD G.J.	120.0
					PLESZYNSKI M.	0.0
541	1	APPROVED		LEP	CONPER M.D.	700.0
542	F-S	APPROVED	PARASITE	BSA-RAD	LU D.C.	0.0
543	1	APPROVED		P3	CARETTO A.A.	120.0
544	1	APPROVED		LEP	WILHELMY J.B.	30.0
545	1	APPROVED	PARASITE	BSA-RAD	BRUN R.D.	0.0
546	F-S	COMPLETE	FEAS STUDY	EPICS	BRISCOE W.J.	50.0
	1	APPROVED		EPICS	NEFKENS B.M.K.	200.0
547	1	APPROVED		SMC	EGAN P.D.	250.0
					HUGHES V.W.	0.0
					KANE J.R.	0.0
548	1	INACTIVE		EPICS	IVERSEN S.G.	0.0
					SETH K.K.	0.0
549	1	APPROVED		EPICS	SETH K.K.	425.0
550	1	APPROVED		EPICS	SETH K.K.	250.0
551	1	REJECTED		EPICS	SETH K.K.	0.0
552	1	APPROVED		SMC	HUGHES V.W.	110.0
					EGAN P.D.	0.0
553	1	APPROVED		P3	RIINDRERG R.S.	36.0
	2	APPROVED		LEP		18.0

STATUS OF PROPOSALS AS OF 09/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
554	1	APPROVED		ISTRAD	BROWN	R.D. 0.0
				AB-NUCCHEM	COST	J.R. 0.0
555	1	COMPLETE		P3	IMANTSHI	N. 100.0
					VIETRA	D.J. 0.0
556	1	APPROVED	FEASTJBY	HRS	BERTOZZI	W. 48.0
557	1	APPROVED	PARASITE	AB-NUCCHEM	COWSIK	R. 0.0
558	1	APPROVED		EPICS	BAER	H.W. 252.0
					BURLESON	G.R. 0.0
559	1	DEFER		NEUTRINO-A	DUNNG-VAN	N. 0.0
					PHILLIPS	G.C. 0.0
560	1	APPROVED		BSA-RAD	HARVEY	A. 0.0
561	1	APPROVED		LEP	BLECHER	N. 503.0
					OBENSHAIN	F. 0.0
					HYNES	M. 0.0
562	1	APPROVED		P3	JACKSON	H.E. 320.0
					SCHIFFER	J.P. 0.0
563	1	APPROVED		HRS	HOFFMANN	G.W. 150.0
564	1	APPROVED		P3	MCKEOWN	R.D. 340.0
565	1	APPROVED		EPICS	ZEIDMAN	B. 200.0
					GEESAMAN	D.F. 0.0
566	1	REJECTED		HRS	GARELICK	D.A. 0.0
					HURST	R.B. 0.0
567	1	APPROVED		LEP	GOTOW	K. 300.0
					MINEHART	R.C. 0.0
					RITCHIE	B.G. 0.0
568	1	REJECTED		EPICS	BURLESON	G.R. 0.0
					MORRIS	C.L. 0.0
569	1	REJECTED		EPICS	DEHNHARD	D. 0.0
					HOLTKAMP	D.B. 0.0
570	1	APPROVED		EPICS	HOLTKAMP	D.B. 255.0
					FORTUNE	H.T. 0.0
571	1	APPROVED		SNC	ODDOS	S.A. 350.0
					HEFFNER	R.H. 0.0
					SCHILLACE	M.E. 0.0
572	1	APPROVED		EPICS	GREENE	S.J. 200.0
					MOORE	C.F. 0.0
573	1	APPROVED		EPICS	BLANPIED	G.S. 279.0
574	1	REJECTED		HRS	BLANPIED	G.S. 0.0
575	1	REJECTED		HRS	BLANPIED	G.S. 0.0
					HOFFMANN	G.W. 0.0
576	1	APPROVED		LEP	R775	P.G. 200.0
					PREEDON	B.M. 0.0
					CHAMT	N.S. 0.0
577	1	REJECTED		EPICS	GREENE	S.J. 0.0
					FORTUNE	H.T. 0.0
578	1	REJECTED		EPICS	MORRIS	C.L. 0.0
					FORTUNE	H.T. 0.0
579	1	APPROVED		AB-NUCCHEM	FAUBEL	W. 1.0
580	1	APPROVED		HRS	TRIPP	S.J. 90.0
					DEHNHARD	D. 0.0
581	1	APPROVED		EPICS	MASTERSON	T.G. 180.0
					BODRIE	R.L. 0.0
582	1	REJECTED		EPICS	COTTINGAME	W.R. 0.0
					BURLESON	G.R. 0.0
583	1	REJECTED		HRS	PAULETTA	G. 0.0
584	1	REJECTED		EPICS	DEHNHARD	D. 0.0
					FORTUNE	H.T. 0.0
585	1	APPROVED		HRS	PAULETTA	G. 80.0
586	1	APPROVED		EPB	BRYANT	H.C. 0.0
					GRAM	P.A.M. 0.0
587	1	APPROVED		EPB	SMITH	W.W. 0.0
					ONNAHUE	J.B. 0.0

STATUS OF PROPOSALS AS OF 03/10/16.

PROP. NO.	PHASE	STATUS	CONDITIONS	CHANNEL	SPOKESMAN	PAC-HRS
588	1	APPROVED		EPB	CLARK D.A.	0.0
					BRYANT H.C.	0.0
589	1	RESUBMIT		EPB	GLASS G.C.	0.0
					NORTHCLIFF L.C.	0.0
590	1	APPROVED		EPB	SYMONS J.E.	330.0
	2	DEFER		EPB	NORTHCLIFF L.C.	0.0
591	1	APPROVED		EPB	DEVRIES R.M.	310.0
					DIGIACOMO N.J.	0.0
592	1	APPROVED		EPB	DEVRIES R.M.	140.0
					DIGIACOMO N.J.	0.0
593	1	REJECTED		HRS	BLESZYNSKI M.	0.0
					MCCLELLAND J.B.	0.0
					WHITTEN C.A.	0.0
594	1	APPROVED		SAC	REIDY J.J.	34.0
595	1	APPROVED		P3	JOYTH C.J.	264.0
					VIETRA D.J.	0.0
596	1	RESUBMIT		LEP	CRAMER J.G.	0.0
					MORRIS C.L.	0.0
					SPRITHWAT W.J.	0.0
					MOORE C.F.	0.0
597	1	APPROVED		EPICS	HALPERN J.	126.0
					EISENSTEIN R.A.	0.0
598	1	APPROVED		EPICS	COTTINGAME W.B.	100.0
599	1	REJECTED		EPICS	MOORE C.F.	0.0
600	1	REJECTED		EPICS	MOORE C.F.	0.0
					HINTZ N.M.	0.0
601	1	APPROVED		EPICS	HINTZ N.M.	174.0
602	1	APPROVED		EPICS	HARVEY C.J.	120.0
					DEHNHARD D.	0.0
603	1	APPROVED		AB	TURKEVICH A.L.	20.0
604	1	REJECTED		EPICS	SETH K.K.	0.0
605	1	APPROVED		EPICS	SETH K.K.	100.0
606	1	APPROVED		EPICS	SETH K.K.	360.0
607	1	APPROVED		LEP	ALSTER J.	360.0
					BAER H.W.	0.0
					BOWMAN J.D.	0.0
608	1	REJECTED		EPICS	KING N.S.P.	0.0
					ANDERSON R.E.	0.0
					BOUDRIE R.L.	0.0
609	1	APPROVED		NEUTRINO-A	KRUSE H.W.	0.0

CONTENTS BY CHANNEL

AB-NEUTRON

Exp. No.	Experiment Title	Page No.
55	Inverse Photodisintegration of the Deuteron Test of the Time-Reversal Invariance of Electromagnetic Interactions of Hadrons	34
56	Study of Neutron Spectrum From Proton Bombardment of Deuterium in the 300- to 600-MeV Region	35
65	Neutron-Proton Polarization Measurements Using a Polarized Target: Phase I. The n-p Polarization Observable $P(\theta)$	42
66	Neutron Polarization Measurements with a Polarized Target: Phase II. The n-p Spin Correlation Observable, $C_{nn}(\theta)$	42
124	Measurement of the Neutron Energy Spectrum In $p + p \rightarrow n + \pi^+ p$	76
125	Elastic Neutron-Proton Back-Angle Differential Cross-Section Measurements 300-800 MeV	76
129	Pion Production in Neutron-Proton Collisions	78
185	Deuteron Production in $NP \rightarrow D\pi\pi$	111
189	Search for Condensed Nuclear States and Study of High- q^2 Low- ν Nuclear Interactions	113
193	Measurement of Small-Angle Neutron Elastic Scattering from Protons	115
205	(n,p) Charge-Exchange and Neutron-Induced Quasi-Free Scattering of Light Nuclei	121
208	Measurement of $\sigma(\theta)$ for n-p Elastic Scattering At Forward Angles	123
255	Measurement of $\sigma(\theta)$ for n-p Elastic Scattering at 460 MeV	148
262	Test of Isospin Invariance in the Reaction $np \rightarrow d\pi^0$	152

263	Measurement of the Energy and Angular Variation of the np Charge-Exchange Cross Section	153
264	Measurement of the Energy Variation of the nD Elastic Differential Cross Section Near 180°	154
279	Measurement of Neutron-Neutron Differential Cross Section and a Test of Charge Independence	161
360	The Measurement of the Polarization Transfer Coefficients D_t and A_t^z at 800 MeV for the Reactions $d(\bar{p}, \bar{n})2p$, ${}^7\text{Li}(\bar{p}, \bar{n}){}^7\text{Be}$, and ${}^9\text{Be}(\bar{p}, \bar{n}){}^9\text{B}$	205
366	Nonresonant Pion Production in the Reaction $np \rightarrow \pi^- pp$	208
387	Energy Dependence of the Forward Angle np Differential Cross Section	219
402	A Measurement of the Polarization Transfer Coefficients $D_t(0^\circ)$ and $A_t^z(0^\circ)$ in the Reaction $\bar{p} p \rightarrow \bar{n} X$ at 800 MeV	228
403	A Measurement of the Triple-Scattering Parameter D_t for the Charge-Exchange Region in np Scattering	228
440	Very Forward n-p Scattering	248
457	Measurement of the Quasi-Free pn and pp and Free pp Analyzing Powers, 500-800 MeV	256
496	A Measurement of the Energy Dependence of Neutron Spectra at 0° for the Reaction $pp \rightarrow nX$	275
498	Measurements of Longitudinal Cross-Section Difference for Longitudinal Polarized Beam and Target, 1. $\Delta\sigma_L(pp)$, 2. $\Delta\sigma_L(pd)$ 3. $\Delta\sigma_L(np)$	277
504	Measurement of the Total Cross-Section Difference for Proton-Proton and Proton-Neutron Scattering in Pure Transverse Initial Spin States in the 400- to 800-MeV Region	280
505	Measurement of the Transverse Spin-Spin Asymmetry in the Reaction $pp \rightarrow d\pi^-$ IN THE 500- to 800-MeV Region	281
528	Exploratory Measurement of $\Delta\sigma_L$ in Free Neutron-Proton Scattering at 800 MeV	292

AB NUCLEAR CHEMISTRY

Exp. No.	Experiment Title	Page No.
103	Spallation Yield Distributions from Pion Interactions with Complex Nuclei	64
104	Proposal for LAMPF Experiment: Studies of the Proton- and Pion-Induced Fission of Medium-Mass Nuclides	65
105	Nuclear Spectroscopy Studies of Proton-Induced Spallation Products	65
106	Proton-Induced Spallation Reactions Related to the Isotope-Production Program at LAMPF	66
118	Fragment Emission from Pion Interactions with Complex Nuclei	71
119	Cross Sections of Simple Nuclear Reactions Induced by Pi-Mesons	72
123	Nuclear Structure Effects in Pion-Induced Nuclear Reactions	75
150	Search for Polyneutron Systems	91
169	Request for Proton Irradiations at LAMPF for Project JUMper	102
243	Recoil Studies of Deep Spallation and Fragmentation Products from the Interaction of 800-MeV Protons with Heavy Elements	141
282	Measurement of Cross Sections for Proton-Induced Formation of Spallation Products in Copper by Activation Analysis	162
294	High-Energy Nuclear Reactions	169
301	Impairment of Superconducting Characteristics by Proton Irradiation	173
383	Nickel Irradiation with Protons and Neutrons	217
407	The Effect of Distribution Vibration on Void Growth in Metals During Irradiation	230
410	Radiation Effects in Amorphous Metals Due to 800- MeV Protons	232
424	Preliminary Experiments for Double Charge Exchange and (μ^- , e^+) Searches	239
554	Irradiation of Technologically Important Metals With 800-MeV Protons Using the Isotope Production Facility at LAMPF	305

555	Total Cross-Section Measurements of the Single-Charge-Exchange Reaction $^{12}\text{C}(\pi^+, \pi^0)^{12}\text{N}(\text{g.s.})$	306
557	Exposure, in a Parasitic Mode, of a 3 cm $\times$ 3 cm $\times$ 1 cm Stack of Solid Track Detectors to A π^- Beam	307
579	A Radiochemical Study of Neutron-Deficient Products from 500 MeV of ^{238}U	319
603	Search for Deltas in a Complex Nucleus by A Radiochemical Technique	332

BIOMED

Exp. No.	Experiment Title	Page No.
19	Development of a Generation-II Image Intensifier-Vidicon Television System for Meson-Tissue Interaction Visualization	12
44	Radiobiology of Negative-Pi Mesons, A Preliminary Study	29
78	Proton Beam Monitor	49
83	Investigation of Multiwire Proportional Counters For Treatment Volume Visualization	52
84	Quality of Meson Radiation Fields	53
143	Study of the Radiobiological Properties of Negative Pions	86
151	Determination of Heavy Charged Particles From Stopped and Moving Negative Pions in Water by Solid Dielectric Track Recorders	91
167	Heavy Fragment Formation Following π^- Absorption in ^{12}C	101
168	Formation of ^4H Following π^- Absorption in ^6Li and ^7Li	102
171	Study of Negative-Pion Beams by Plastic Nuclear Track Detectors	103
187	Nuclear Gamma Rays Produced by Negative Pions Stopping in Carbon, Nitrogen, Oxygen, and Tissue	112
188	Negative-Pion Effects on Immunocompetent Cells	112
195	Nuclear Resonance Effect in Pionic Atoms	116
196	A Visualization Experiment with Charged Particles	117
198	Effects of Pions on DNA on Nondividing Cell Systems	118
207	Measurement of Neutron Spectrum and Intensity Resulting from π^- Capture in Water Phantom and Human Tissue	123
209	Pion Interactions in Nuclear Emulsions	123
212	Comparative Effectiveness of Negative Pions vs ^{252}Cf in a Tumor-Animal System	124
215	Visualization of Stopping Pion Distribution	126

217	π^- Production Cross Sections	126
218	Pion Dosimetry with Nuclear Emulsions and Alanine	127
235	Radiation Repair of Normal Mammalian Tissues	136
236	Biological Effects of Negative Pions	137
239	Study of ^{11}C and ^{13}N Production by π^- Irradiation of C, N, O, and Tissue for Radiotherapy Monitoring	138
242	Survival of Synchronized Cultured Human-Kidney T-1 Cells Exposed to Stopping Pions and X Rays at Various Times after Mitosis	140
244	Systems Development for Efficient Utilization of High-Purity Germanium Mosaic Detectors for Tumor Localization	141
270	Therapy Beam Development — Biomedical Channel Tuning	158
271	Therapy Beam Development — Dosimetry	158
272	Therapy Beam Development— Microdosimetry	158
273	Therapy Beam Development — LET Measurements	159
274	Pion Radiobiology	159
275	Pion Clinical Trials	159
285	Migration of ^{11}C and ^{13}N Radioactivity Produced <i>in vivo</i> by Negative Pions	164
300	π^- Coulomb Capture and π^- Transfer in Tissue, Tissue-Equivalent Liquid, and Simple Compounds	173
304	Study of the Auger Process in Pionic Atoms	174
372	Stopping Power of $\pi^\pm$ at Energies below 100 MeV	212
380	RBE and OER for Normal and Tumor Tissues	216
384	Biological Intercomparison of π^- Therapy Beams at TRIUMF and LAMPF Using Mouse Testes as a Biological Test System	218

BEAM STOP A RADIATION (BSA-RAD)

Exp. No.	Experiment Title	Page No.
45	Radiation-Damage Studies— High-Temperature Reactor Materials and Type II Superconductors	29
111	Search for New Neutron-Rich Nuclides Produced by Fast Neutrons	68
113	Radiation Damage and Helium Embrittlement in Elevated-Temperature Reactor Structural Alloys	69
147	Determination of the Energy Distribution of Neutrons from the LAMPF Beam Stop	88
157	Microdistribution of Thorium in Geologic Samples	95
161	The Microdistribution of Thorium in Meteorites	98
174	Investigation of the Chemical Reactions of Atomic ^{18}F as a Means for Direct Synthesis of ^{18}F -Labeled Compounds	105
237	Radiation-Damage Studies on Structural Materials for Advanced Reactors	137
251	Neutron Irradiation of Copper Tensile Specimens	146
290	Measurement of the Neutron Spectrum from the Main Beam Stop at LAMPF with a Self-Contained Two-Parameter Spectrometer	167
326	Electrical Component Radiation-Effects Study	187
378	A-6 Neutron Flux and Spectrum Investigation	215
406	Neutron Flux Characterization at A-6 Radiation-Effects Facility	230
467	Irradiations in Support of Ferficon Studies	261
542	Feasibility Study: Using an Existing Neutron Beam Pipe at LAMPF Beam Stop for Crystal Diffraction Spectrometer Experiments	299
545	Fusion Materials Neutron Irradiations A Parasite Experiment	301
560	Study of Neutron-Irradiation-Induced Growth of Metals at Radiation Effects Facility	309

EXTERNAL PROTON BEAM (EPB)

Exp. No.	Experiment Title	Page No.
26	Neutron Time-of-Flight Experiment at Beam Stop	16
27	p-p Spin Correlation Experiments	17
33	Search for Asymmetry in π^+ Production by Proton-Proton Collision	21
42	Breakup of Few-Nucleon Systems and Nuclei	27
52	Solitary Micropulses by Photodetachment of the H^- Beam	33
81	Study of Neutron-Proton and Proton-Proton Coincidence Spectra from $p + d \rightarrow n + p + d$ Reaction	51
92	Search for Structures in π - π Mass-Spectrum Near Threshold	58
124	Measurement of the Neutron Energy Spectrum in $p + p \rightarrow n + \pi^+ p$	76
128	WNR Storage Ring Stripper Experiment	77
137	Search For Parity-Violating Contribution to Scattering of Hadrons	83
153	Investigation of Nuclear Gamma Rays Resulting from In-Flight Pion and Proton Reactions	92
159	Charged-Particle Emission in Proton-Induced Reactions as a Feasibility Study in the Use of Intrinsic Germanium Detectors with the Primary LAMPF Beam .	96
160	Measurement of "D," "R," and "A" Parameters in p-p Elastic Scattering	97
176	P-Nucleus Total and Total Reaction Cross-Section Measurements	106
186	Measurement of (p, π^+) and (p, π^-) Reaction Cross Sections on Complex Nuclei ..	111
192	Measurement of the Emittance Growth in H^- Stripping	115
194	P-P, D, R, and A Measurements	115
197	Investigation Reaction $p + d \rightarrow {}^3\text{He} + \pi^0$ at LAMPF Energies	117
200	Study of the Photodetachment Spectrum of H^- in the Vicinity of 11 eV	119
219	Double Pion Production in Proton-Proton Scattering	127

223	Studies of the $(p,n\bar{p})$ Charge-Exchange Reaction	129
241	Proposal to Search for Direct Lepton Production at LAMPF	140
278	Study of Reaction Mechanisms Using Internal Conversion Techniques	161
279	Measurement of Neutron-Neutron Differential Cross Section and a Test of Charge Independence	161
289	Measurement of the Phase of the Forward Nucleon-Nucleon Spin-Independent Elastic-Scattering Amplitude at 800 MeV	166
296	Measurement of Inclusive π^0 Production on Hydrogen Isotopes and Selected Nuclei at $T_p = 800$ MeV	170
321	Studies of Nucleon Clustering in Light Nuclei	184
323	Stark-Effect Quenching of Resonances in the Photodisintegration of the H^- Ion..	185
336	Study of the Spin Dependence of Proton-Proton Pion Production Reactions	192
339	Survey of Photodetachment Cross Section of H^- from Threshold to 15 eV and its Dependence upon Electric Field	194
341	Study of $pd - d\pi^+n$ Reaction Mechanisms	195
449	Survey of the Single and Double Photodetachment Cross Section of the H^- Ion from 14 to 21.8 eV	252
468	Mechanisms of Luminescence Induced by Protons Incident of Ultraviolet Grade Optical Materials	261
492	Polarimeter Calibrations and Search for Energy-Dependent Structure in pp Elastic Scattering via Cross Section, Analyzing Power, and Wolfenstein Parameter Measurements	273
498	Measurements of Longitudinal Cross-Section Difference for Longitudinal Polarized Beam and Target, 1. $\Delta\sigma_L(pp)$, 2. $\Delta\sigma_L(pd)$, 3. $\Delta\sigma_L(np)$	277
512	Proton-Proton Elastic-Scattering Measurements of the $A_{ss}(\theta)$, $A_{LL}(\theta)$, and $A_{sL}(\theta)$ Spin Correlation Parameters at 500, 650, and 800 MeV	283
517	Polarized Beam and Target Experiments in the p-p System: Phase I. A_y and A_{yy} for the $d\pi^+$ Channel and A_{yy} for the Elastic Channel from 500 to 800 MeV	285
518	Polarized Beam and Target Experiments in the p-p System: Phase II. Measurements of A_{xx} and A_{xx} for the $d\pi^+$ Channel and for the Elastic Channel from 500 to 800 MeV	286

526	Measurement of Analyzing Powers in $pd \rightarrow pd$, $pp \rightarrow d\pi$, and $pp \rightarrow pp$ Reactions at 520, 600, 650, and 730 MeV	291
530	H^- -Magnetic Stripping Rates	294
586	A Study of the Effects of the Very Strong Electric Fields on the Structure of the H^- Ion	322
587	Fundamental Experiments with Relativistic Hydrogen Atoms: Exploratory Work	323
588	A Search for Long-Lived States of the H^- Ion	324
589	Free-Forward np Elastic-Scattering Analyzing Power Measurements at 800 MeV	325
590	Measurement of $D(0)$ in p-n and n-p Scattering at 800, 650 MeV and Other Energies with Associated p-p Measurements	326
591	An Investigation of Inclusive One Pion Production in Proton Nucleus Collisions	326
592	An Investigation of Two Pion Production and Correlations in Proton Nucleus Collisions at 800 MeV	326

EPICS

Exp. No.	Experiment Title	Page No.
9	Elastic and Inelastic Pion Scattering from Calcium Isotopes	5
13	Study of π^+ -Induced Double-Charge-Exchange Reactions	8
14	π^+ and π^- Elastic and Inelastic Scattering from ^{16}O	8
17	Inelastic Pion Scattering from Light Nuclei ^6Li , ^{10}B , and ^{14}N	11
18	Survey of π Scattering by Complex Nuclei	12
22	Pion Channeling	15
23	A Survey of Pion-Nucleus Elastic and Inelastic Scattering at 180 MeV	15
39	Search for (π, p) Reactions with EPICS	25
41	Search for Muonium to Antimuonium Conversion	26
43	Elastic and Inelastic Scattering of Pions From Nuclei in the Lead Region	28
46	Elastic Pion-Deuteron Scattering	30
47	Elastic and Inelastic Pion Scattering from ^{89}Y	30
48	Elastic and Inelastic Pion Scattering from the Nickel Isotopes	31
61	π^+ and π^- Forward Elastic Scattering from Oxygen and Carbon	38
74	Study of Pion-Induced Double-Charge-Exchange Reactions on Low-Z Elements ..	47
77	π^+ Elastic and Inelastic Scattering from Carbon, Magnesium, Strontium, and Lead Isotopes at 100 MeV	48
87	π^+ and π^- Scattering from ^3He and ^4He	55
89	Detailed Study of the Resonance Behavior of the Total Elastic Cross Section in Pion-Nucleus Scattering	56
130	EPICS Tuneup Proposal: Pion Carbon Scattering	79
133	Preliminary Pion-Channeling Experiments	81
136	Large-Angle Pion-Nucleus Scattering	82

145	Research for Nonquasi-Free Processes in the $^4\text{He}(\pi,\pi p)$ Reactions	87
146	Inelastic Pion Scattering to Giant Multipole States	88
156	Survey of Quasi-Elastic Pion Scattering	94
224	Inelastic Pion Scattering from ^{148}Sm and ^{152}Sm	130
229	π^+ vs π^- Inelastic Excitation of Low-Lying Collective States in N $\approx$ 28 Nuclei	132
231	Selectivity in π^+ vs π^- Inelastic Excitation of Odd-A Nuclei	134
232	Inelastic Pion Scattering by ^{24}Mg and ^{26}Mg	135
245	Study of the (π^-,n) and $(\pi,\pi p)$ Reactions in ^3He and Heavier Nuclei by Detecting Recoiling Tritons or Deuterons	142
246	Studies of π^+ Scattering at 50 MeV from Light Nuclei	143
252	Pion Charge Exchange and Inelastic Scattering on Lithium Nuclei by Observing the Gamma Decays	146
265	Study of Prompt Nuclear Deexcitation Gamma Rays from Pion Interactions with ^6Li , and ^{12}C	154
291	Comparison of the Quasi-Elastic Ratio $\sigma(\pi^-, \pi^-n)/\sigma(\pi^+, \pi^+n)$ to the Ratio $\sigma(\pi^+, \pi^+p)/\sigma(\pi^-, \pi^-p)$ in A Coincidence Experiment	167
310	(π^+, π^-) Double-Charge-Exchange Reactions Using Core 2n Targets	179
317	Inelastic Pion Scattering to the 1^+ States of ^{12}C	182
318	Excitation of Single-Particle States in Nuclei by Low-Energy Inelastic Pion Scattering	183
325	Pion and Muon Multiple Coulomb-Scattering Experiment on the EPICS Beam Line	186
332	Masses of Extremely Neutron-Rich Nuclei by (π^-, π^+) Reactions	190
338	Mass Measurements of Exotic Neutron-Rich Nuclei Using the (π^-, π^+) Reaction ..	193
340	Pion Scattering From Aligned ^{165}Ho	195
342	Study of the (π^+, p) Reaction in ^{12}C	196
368	Inelastic Pion Scattering to the $19.2 \pm 0.3\text{-MeV}$ State in ^{12}C	209

369	Inelastic Pion Scattering by ^{17}O , ^{18}O , and ^{19}F	209
389	Inelastic Pion Scattering from Light Nuclei: ^{10}B , ^{11}B , ^{14}N , and ^{16}N	220
391	Inelastic $\pi^{\pm}$ Scattering on ^7Li	222
413	Mass Measurement of ^{26}Ne and ^{48}Ar by the (π^-, π^+) Reaction	234
419	Excitation of Single-Particle and Core-Coupled States in ^{207}Pb and ^{208}Bi	237
423	Excitation of Giant Resonances by Inelastic Pion Scattering	239
426	Elastic and Inelastic Scattering of 162-MeV π^+ and π^- from ^{13}C	240
442	Study of the Inclusive Pion Double-Charge-Exchange Reaction	248
446	Study of E0 Giant Resonances	250
447	Measurement of Neutron and Proton Transition Matrix Elements in ^{138}Ba by Comparison of π^+ and π^- Inelastic Scattering	251
448	A Study of π^+ Double-Charge-Exchange Scattering at Small Angles on Various Nuclei	251
452	Elastic and Inelastic Scattering of $\pi^{\pm}$ by ^{13}C	254
456	The (π, d) Reaction on ^{12}C at 60 MeV	255
460	An Investigation of the Stability of ^6H , ^7H , and ^8He by (π^-, π^+) Reactions	258
463	Comparative Study of the (π^+, π^-) and (π^-, π^+) Reactions on ^{12}C	259
478	$\pi^{\pm}$ Elastic Scattering from Deuterium	266
481	Excitation of High-Spin States in $T_z = 0$ s-d Shell Nuclei by Pion Inelastic Scattering	268
482	Excitation of High-Spin Particle-Hole States in $T \neq 0$ Nuclei: ^{64}Fe , ^{66}Ni , ^{88}Sr or ^{90}Zr , ^{88}Y , ^{120}Sn , ^{208}Pb	269
484	Inelastic Pion Scattering from ^{148}Sm and ^{152}Sm	270
488	Pion Scattering from ^{27}Al and ^{30}Si	272
493	Pion Elastic Excitation of 4^- States in ^{16}O	274
495	Isospin Mixing in ^{13}C	275
506	Inelastic Pion Scattering to the Unnatural Parity Levels in ^{13}C and ^6Li	281

507	Study of the (π^+ ,p) Reactions in He	282
509	Survey of Inelastic Pion Scattering by Odd-A Nuclei	282
510	Energy Dependence of Elastic and Inelastic Scattering of $\pi^\pm$ by ^{13}C between 116 and 280 MeV	283
511	Pion Double Charge Exchange on Neutron-Rich Nuclei	283
516	The (π^+ ,p) Reaction on $^{16,18}\text{O}$	285
522	Excitation of Giant Resonance States in ^{90}Zr and ^{208}Pb with 150-MeV Pions	289
537	A Study of the Relation Between the (π ,P) and (p,d) Reaction in a Pion Exchange Model	297
539	Search for Pure Neutron/Proton Transitions in ^{14}C	298
546	Investigation of the Spin Form Factor of Tritium and Helium-Three	302
548	An Investigation of the Isovector Character of the 2_2^- State in ^{26}Mg by π^+ , π^- Inelastic Scattering	303
549	A Study of the DCX Reaction Mechanism — The $^{42}\text{Ca}(\pi^-, \pi^-)^{42}\text{Ti}$ Reaction	303
550	Excited State Spectra of the Exotic Nuclei ^{18}C and ^{20}Ne by (π^-, π^+)DCX Reactions	304
551	Masses of ^{40}Ti and ^{58}Zn by (π^-, π^+) Reaction	304
558	Measurement of (π^-, π^-) Reactions on $^{13,14}\text{C}$ and ^{26}Mg	307
565	Excitation of High-Spin Particle-Hole States in ^{54}Fe and ^{58}Ni	311
568	Measurements of the Masses of $T_z = -2$ Nuclei and of the Systematics of (π^+, π^-) Cross Sections on $N = Z$ Nuclei	313
569	π^-/π^- Inelastic Scattering from ^{19}F	313
570	Investigation of the Structure of ^{16}O with Pion Inelastic Scattering	315
572	A-Dependence of the (π^+, π^-) Reaction and the Width of A Double Isobaric Analog State in Heavy Nuclei	316
573	Pion Scattering From ^{24}Mg and ^{26}Mg	316

577	Measurement of Angular Distributions for $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}$	318
578	Pion Inelastic Scattering from ^{20}Ne	319
581	π^+ Elastic Scattering from Deuterium at 237 MeV	320
582	Quadrupole Scattering of Pions by ^9Be	320
584	Good-Resolution Study of $^{16}\text{O}(\pi, \pi')$	321
597	The Study of Broad Range Pion Inelastic Scattering Spectra (With Emphasis on the Excitation of the Giant Monopole Resonance)	329
598	Inelastic Pion Scattering to the Unnatural Parity Levels in ^6Li	329
599	Isospin Mixing Measurements Using the π^+ vs π^- Inelastic Scattering Reaction on ^{40}Ca	330
600	π^+ vs π^- Inelastic Excitation of High-Spin, Unnatural Parity States in ^{208}Pb	331
601	Determination of Isoscalar and Isovector Transition Rates for Low-Lying Collective States in ^{90}Zr and ^{208}Pb by π^+ and π^- Inelastic Scattering	331
602	Neutron-Proton Components of Inelastic Transitions in Pion Scattering on ^{23}Na and ^{25}Mg	332
604	An Investigation of the Near-Stability of ^4H	333
605	A Dibaryon Search at EPICS	333
606	Tests of the (N-Z) Dependence of Pion Double Charge Exchange	334
608	Inelastic Scattering of Pions to Giant Resonances	334

HIGH-RESOLUTION SPECTROMETER (HRS)

Exp. No.	Experiment Title	Page No.
4	Large-Angle Elastic Scattering of Protons from Helium and the Quasi-Elastic Knockout of Alpha Particles by 800-MeV Protons	2
5	Inelastic Scattering of 800-MeV Protons from Nuclei to Study Quasi-Free Modes	3
6	Study of n-p and p-p Correlations in Nuclei	4
10	Search for (p, π) Reactions with HRS	6
15	Elastic Scattering and Total Cross-Section Measurements of Proton on Hydrogen, Deuterium, and Helium	9
49	Elastic and Inelastic Proton Scattering from the Nickel Isotopes and from ^{90}Y ...	31
59	High-Resolution Study of the Boson Mass Region, 0 to 490 MeV, Using the HRS	37
73	(p,2p) Experiments Using Laminated Solid-State Detectors	46
109	The Study of the Microscopic Structure of Collective Modes by Medium-Energy Protons	66
117	High-Resolution Study of the Neutron Pickup Reactions	71
138	Inelastic Proton Scattering and Excitation of States of Intermediate Collectivity in Open-Shell Nuclei	83
139	Preliminary Proton-Scattering Survey with HRS	84
158	Search for (p,K) Reactions	95
177	Quasi-Elastic Knockout of Alpha Particles by Medium-Energy Protons	107
178	Proton-Scattering Survey on s-d Shell Nuclei	107
183	Proton-Scattering Survey on Heavy Deformed Nuclei	110
202	The (p,t) Reaction on Spherical Nuclei	119
204	Excitation and Asymmetry Measurement of $T \approx 1$, High-Spin, Nonnormal-Parity "Particle-Hole" State by (p,p') Scattering in the Intermediate-Energy Range	121

223	Studies of the $(p,n\bar{p})$ Charge-Exchange Reaction	129
227	(p,n) Reaction Studies on Light Nuclei	131
233	Search for δ Configurations in Nuclei	135
249	The (p,π^+) Reaction on ${}^4\text{He}$ with 800-MeV Protons	144
256	I. p-Nucleus Elastic Scattering at $q^2 = {}^9\text{Be}$, C, and the Study of p-Nucleus Interactions in Co and Au up to $m^* = q^2/2\nu \cong 20$	148
257	II. Inclusive (180°) Production of Neutrons in High- q^2 p-Nucleus Collisions of High Effective Mass	149
258	Study of Mechanisms for Ejection of ΔC High-Momentum Particles from Nuclei by Study of the Coincidence Spectrum in $p + A \rightarrow (p,d,t) + (p,d,t) + X$	149
260	Determination of Neutron Density Distributions from Elastic Proton Scattering at 800 MeV	151
261	Intermediate Energy (p,d) Reaction Mechanism Studies	152
280	Measurement of Forward-Scattering Cross Section in p-p and p-d Elastic Scattering between 500-800 MeV	162
306	Forward-Angle Analyzing Power and Backward-Angle Differential Cross-Section Measurements of Collective-State Excitations by Intermediate-Energy Protons	175
307	Polarization in p- ${}^4\text{He}$ Elastic Scattering at 800 MeV	176
311	Elastic-Scattering Survey Using Polarized Protons	179
343	High-Spin States in Medium-Energy Proton Inelastic Scattering	196
345	Study of the Structure Function and the Connection between Elastic and Inelastic Cross Section at Large t in the p- ${}^4\text{He}$ Interaction	197
346	Study of High-Momentum Components in Nuclei Using a Polarized Proton Beam	197
347	Search for "Orbit-Flip" States by Inelastic Proton Scattering	198
351	Search for Deuteron Abnormal Matter	200
352	Determination of Neutron Mass Distributions from Proton Measurements [$P(t)$ and $d\sigma/dt$] in Isotopes on the Calcium Region	201
353	Proton Elastic and Inelastic Scattering at ~ 600 MeV	201

354	Scattering of 800-MeV Protons from ^{12}C and ^{13}C at Momentum Transfers Greater Than 4 fm^{-1}	201
355	Further Elastic-Scattering Cross Section and Analyzing Power Measurements on ^{208}Pb and $^{116,124}\text{Sn}$	202
356	Analyzing Power and Cross-Section Measurements for Inelastic Proton Excitation of Simple States	203
359	Asymmetry Measurements of the (p,π^+) Reaction on Light Targets at $T_p = 800\text{ MeV}$ and $T_p = 650\text{ MeV}$	204
361	Cross-Section and Asymmetry Measurements for the Reactions $^2\text{H}(\bar{p},\pi^+)^3\text{H}$ and $^3\text{He}(\bar{p},\pi^+)^4\text{He}$ at Intermediate Energies	205
362	Study of Quasi-Free $(p,2p)$ Reactions at 800 MeV with Use of Unpolarized and Polarized Beam	206
365	Comparison of Density Distributions of ^{207}Pb , ^{208}Pb , and ^{209}Bi	207
367	Study of High-Spin States by the $(p,^3\text{He})$ Reaction	208
376	Large-Angle Elastic Scattering on ^{48}Ca by Medium-Energy Protons	214
385	Measurement of the $\bar{p} + n$ Analyzing Power, $A_y(\theta)$, from $\theta_{\text{c.m.}}$, $10\text{-}70^\circ$	218
386	Total Reaction Cross Sections for P^+ Nuclei at 800 MeV	219
392	A Measurement of the Triple-Scattering Parameters D , R , A , R' , and A' for Proton-Proton and Proton-Neutron Scattering at 800 MeV	223
395	The (p,π^+) Reaction on ^{16}O and ^{40}Ca	224
397	A Measurement of the Triple-Scattering Parameters R , A , R' , and A' for Proton-Nucleus Elastic Scattering	225
398	A Systematic Study of Isotopic (Isotonic) Dependence of the Neutron-Matter Distributions in the Mass-40 Region	226
399	Excitation of Giant Multipole Resonances by 200- to 400-MeV Protons	226
405	The (p,π^-) Reaction on ^{12}C and ^{13}C	229
411	Measurement of Spin-Flip Probabilities in Proton Inelastic Scattering at 800 MeV and Search for Collective Spin-Flip Modes, Preliminary Survey	233
425	Proton Elastic Scattering at $\sim 600\text{ MeV}$ by $^{40,48}\text{Ca}$, ^{90}Zr , ^{208}Pb	240
428	(p,p) and (p,p') on Potassium and Titanium	241

431	Cross Section and Analyzing Power for Inelastic Proton Excitation of Unnatural Parity States in ${}^6\text{Li}$, ${}^{12}\text{C}$, ${}^{14}\text{N}$, and ${}^{18}\text{O}$	242
432	Cross Section for Excitation of Unnatural Parity States in ${}^{12}\text{C}$ at $E_p < 800$ MeV	243
433	Elastic-Scattering Differential Cross Sections and Analyzing Powers for $\bar{p} + {}^{40,48}\text{Ca}$, ${}^{90}\text{Zr}$, and ${}^{208}\text{Pb}$ at ~ 400 MeV	243
434	The (p, π^+) Reactions on ${}^{12}\text{C}$, ${}^{16}\text{O}$, and ${}^{40}\text{Ca}$ around 650 MeV	244
438	The (p, d) Reactions on ${}^{12,13}\text{C}$, ${}^7\text{Li}$, ${}^{16}\text{O}$, ${}^{26}\text{Mg}$, ${}^{28}\text{Si}$, and ${}^{40}\text{Cu}$ between 650 and 800 MeV	246
443	The Energy Dependence in the (p, π) Reaction on ${}^{12}\text{C}$	249
450	Preliminary Cross-Section Measurements for the (p, t) Reaction at 400 MeV	253
451	Inelastic Proton Scattering in the Range 300 to 500 MeV	253
461	Elastic and Inelastic Scattering of 800-MeV Protons from ${}^{18}\text{O}$	258
462	Analyzing Power and Differential Cross Sections for the Reactions $p + \rightarrow d + \pi^+$ and $p + d \rightarrow t + \pi^+$ at ~ 600 and 400 MeV	258
470	Reactive Content of the Optical Potential	263
471	Study of the ${}^{90}\text{Zr}$ and ${}^{208}\text{Pb}$ (p, d) Reactions at ~ 500 MeV	263
472	Study of the (p, d) Reaction on ${}^{90}\text{Zr}$, ${}^{140}\text{Ce}$, and ${}^{208}\text{Pb}$ at 800 MeV	264
473	Study of Giant Multipole Resonances with 800-MeV Protons	264
474	A Measurement of Spin-Dependent Effects in $p + d$ Elastic and Inelastic Scattering	265
475	Scattering of 0.8-GeV Protons from ${}^{20}\text{Ne}$ and ${}^{22}\text{Ne}$	265
476	The Analyzing Power for $\bar{p} + {}^{24,26}\text{Mg}$ at 500 and 800 MeV	266
477	Role of the $p + d \rightarrow d + \pi$ Interaction in Nucleon Transfer Reactions at Intermediate Energies	266
479	Measurement of R , A , R' , and A' in Elastic and Inelastic Scattering of 800-MeV Protons from Light Nuclei: Revised Version of "Q" Proposal	267
485	The Energy Dependence in the $(p, \pi^\pm)$ Reactions	270

486	A Search for Critical Opalescence	271
489	Search for M1 Giant Resonances in the (p,p') Reaction at $E_p = 800$ MeV	272
490	Measurement of $\bar{p}$ -p and $\bar{p}$ -d Elastic Scattering in the Coulomb Interference Region between 600 and 800 MeV	273
497	A Search for Energy-Dependent Structure in the Spin Dependence of Proton-Nucleus Interactions	276
501	Measurement of Differential Elastic Cross Section and Polarization for p-Nucleus Scattering in the Coulomb Interference Region	279
502	Measurement of C_{11} in the Coulomb Interference Region	279
503	Masses of ^{41}Ti and ^{69}Zn by (p, π^-) Reaction	280
508	Dibaryon Resonances in Pion Production	282
519	Study of the Reaction $p(\text{pol}) + d \rightarrow (p,\pi) + X$ to Measure the Analyzing Power and Structure Function for Backward Particles	286
520	Study of the Reaction $p(\text{Polarized}) + (^4\text{He}, ^4\text{He}) \rightarrow (p,d,\pi..) + X$ to Measure the Analyzing Power and Structure Functions for Backward Particles	288
521	Study of the (p,2p) Reaction in D, ^3He , and ^4He for Backwardly Emitted Particles Employing the HRS-LRS	288
531	Excitation of Unnatural Parity States in ^{12}C at 500 MeV	294
532	Measurements of Cross Sections and Analyzing Power in the (p,2p) Reaction of Deuterium	295
533	The Asymmetry in the (p, π) Reaction on ^6Li at 800 MeV	295
534	Measurement of $\bar{p}$ -p and $\bar{p}$ -d Elastic Scattering in the Coulomb Interference Region Between 500 and 800 MeV	296
535	A Study of the Relation Between the (p,d) and (π ,p) Reaction in a Pion Exchange Model	296
538	Analyzing Power and Cross-Section Measurements of the $^4\text{He}(\bar{p},d)^3\text{He}$ Reaction	298
540	Elastic Scattering from Light Nuclei	299
556	A Proposal to Study the (p,p') Process Leading to π -Atomic States	307

563	p + p Elastic Scattering at 800 and 500 MeV	310
566	Inelastic p-p and p-d Cross Sections at 800 MeV — A Search for Narrow Excited States	311
574	Polarized Proton Scattering from ^{40}Ar	317
575	Polarized Proton Scattering From N = 28 Nuclei	317
580	Cross Sections and Analyzing Powers for Elastic and Inelastic Scattering of 515-MeV Protons from ^{13}C	320
583	Measurement of C_{μ} in the Coulomb Interference Region	321
585	Measurement of $\bar{p}$ -p and $\bar{p}$ -d Elastic Scattering in the Coulomb Interference Region Between 500 and 800 MeV	322
593	Measurement of the Spin Rotation and Depolarization Parameters in the $^{12}\text{C}(p,p')$ Reaction for the $1^+ 12.72 \text{ MeV } T \approx 0$ and to the $1^+ 15.11 \text{ MeV } T = 1$ Levels	327

ISOTOPE PRODUCTION AND RADIATION DAMAGE (ISORAD)

Exp. No.	Experiment Title	Page No.
184	Production of ^{82}Sr	110
210	Isotope Production Facility Irradiation Vanadium, Molybdenum, and Lanthanum Targets	124
211	Neutron Irradiation of Copper Single Crystals	124
253	Neutron Irradiation of Metal Samples for Use in Position Annihilation Studies of Defects	147
267	Preparation of Radioisotopes for Medicine and the Physical Sciences Using LAMPF Isotope Production Facility	156
383	Nickel Irradiation with Protons and Neutrons	217
554	Irradiation of Technologically Important Metals with 800-MeV Protons Using the Isotope Production Facility at LAMPF	305

LINE X BEAM STOP (BS)

Exp. No.	Experiment Title	Page No.
184	Production of ^{82}Sr	110

LOW-ENERGY PION (LEP)

Exp. No.	Experiment Title	Page No.
1	Rare Decay Modes of the Neutral Pion	1
2	Total Pion Cross Sections	1
8	Precision Measurement of Soft X Rays from Muonic and Pionic Atoms	5
25	Pion Double-Charge-Exchange Reactions	16
28	Studies of the (π^+, π^0) Reaction	18
29	Elastic Scattering of π^+ and π^- at 10-30 MeV	19
35	Cluster Effects in Nuclear Pion Capture	23
50	Radiative Pion Capture in Light Nuclei	32
54	Elastic Scattering of Mesons in the Energy Range 20-60 MeV	34
67	Development of Pion Beam-Monitoring Techniques	43
78	Proton Beam Monitor	49
79	Calibration of the Pion Beam Transport Systems and a Pion Beam Monitor	49
96	Scattering of 20-40 MeV $\pi^\pm$ by Hydrogen and Deuterium	60
102	Excitation Functions and Angular Distribution Recoil Studies of Simple Pion-Induced Nuclear Reactions	64
121	Interaction of Stopped Negative Pions with Complex Nuclei	73
122	Pionic-Atom X Rays and Nuclear Distributions	74
131	A Study of the $\pi^+ + d \rightarrow p + p$ Reaction at Pion Energies 10-60 MeV	79
140	Study of the ($\pi^\pm, d$) Reaction with an Intrinsic Germanium Detector	85
144	Search for the C-Violating Decay $\pi^0 + 3\gamma$	87
162	Studies of the (π^+, π^0) Reaction on Light Elements	98
164	Pion Total Cross-Section Measurements with an Oriented ^{165}Ho Target	100
170	Study of the Reaction $^{13}\text{C}(\pi^+, \pi^0)^{13}\text{N}$ (Ground State)	103

180	Elastic and Inelastic π^+ -Nucleus Scattering at 25, 50, and 75 MeV	109
181	Measurements of the $\pi^-p \rightarrow \pi^0n$ Angular Distribution at Low Energies and Calibration of the π^0 Spectrometer	109
182	Short-Lived Radioactivities from Pion Bombardment	110
190	A Precision Measurement of the $\pi^- - \pi\pi^0$ Mass Difference	114
191	π^+ -Nucleus Inelastic Scattering to Giant Resonances	114
209	Pion Interactions in Nuclear Emulsions	123
234	A Study of the Inelastic Pion-Scattering Reaction at Pion Energies 10-100 MeV	136
247	Distributions of Products from Interactions of Stopped π^- with Several Medium- and Heavy-Mass Nuclei	143
284	Measurement of the ${}^3\text{He}(\pi^-, \pi^0){}^3\text{H}$ Angular Distribution	164
293	Study of the Dominant Reaction Modes for Pions Interacting with Complex Nuclei	169
295	Study of the Pion-Deuteron Single-Charge-Exchange Reaction $D(\pi^-, \pi^0)2n$	170
299	An Investigation of the Reaction $(\pi^+, \pi^- + p)$	172
303	A Survey of Pion Single-Charge-Exchange Scattering Using Back-Angle Gamma Spectroscopy	174
315	High-Resolution Study of $(\pi^+, 2p)$ Reaction	181
316	π^- -Nucleus Elastic Scattering between 20 and 50 MeV	182
318	Excitation of Single-Particle States in Nuclei by Low-Energy Inelastic Pion Scattering	183
320	A Comparison of (π^+, xn) and (π^-, xn) Reactions	184
322	Systematic Study of Pion-Nucleus Inelastic Scattering at Energies below 100 MeV	185
324	Precision Measurement of Ratios of Certain Light Element Pion Excitation Functions	186
333	$\pi^\pm$ -Nuclear Elastic Scattering at Energies between 50 to 100 MeV	190
348	Study of Giant Resonances with Radiative Pion Capture on Medium-Z Nuclei at LEP	198

350	Study of Pion-Absorption Mechanisms in Nuclei	200
370	Sub-Coulomb π^+ Elastic Scattering and (π^+,p) Reactions ^{208}Pb at $E_\pi = 7\text{-}12$ MeV	211
372	Stopping Power of $\pi^\pm$ at Energies below 100 MeV	212
388	Low-Energy Pion Elastic Scattering from the Proton and Deuteron at 180°	220
393	Angular Distribution Measurements of the Pion Single-Charge-Exchange Reaction on ^{13}C	223
401	Study of the Isobaric Analog Charge-Exchange Reaction $^{15}\text{N}(\pi^+, \pi^0)^{15}\text{O}$	227
412	Search for Analog State Transitions in (π^+, π^0) Reactions on ^7Li , ^{27}Al , ^{90}Zr , ^{120}Sn , and ^{208}Pb and for Collective Isovector States in the (π^-, π^0) Reaction on ^{90}Zr ...	233
415	Two-Nucleon-Out Products from Stopped π^- Interactions	235
441	The $^{12}\text{C}(p, K^+)^{13}_\Lambda\text{C}$ Reaction at 800 MeV	248
465	Radiochemical Study of Pion Single Charge Exchange	259
483	Measurement of the Angular Dependence of Tensor Polarization in the $^2\text{H}(\pi^+, \pi^+)^2\bar{\text{H}}$ Reaction	269
523	Study of the $^{14}\text{C}(\pi^+, \pi^0)^{14}\text{N}$ Reaction	290
524	Study of the Isovector Terms in π -Nucleus Interactions with (π^+, π^0) Reactions on $^{40,42,44,48}\text{Ca}$ and $^{112,118,124}\text{Sn}$	290
525	Excitation of Isovector Transitions with Pion Single Charge Exchange on ^{12}C	291
527	Study of the $^{10}\text{B}(\pi^-, \pi^0)^{10}\text{Be}$ Reaction	292
536	Efficiency Measurements for the π^+ Identification in the Plastic Ball Detector	297
541	A Search for Nuclear Critical Opalescence Using the Reaction $^{40}\text{Ca}(\pi^+, 2\gamma)$	299
544	Search for a Fast Fission Process	301
553	Study of Target Thickness Effects in the Cross-Section Measurement of the Pion Single-Charge-Exchange Reaction $^{13}\text{C}(\pi^+, \pi^0)^{13}\text{N(g.s.)}$ from 50 to 350 MeV	305
561	$\pi^\pm$ — Nuclear Elastic Scattering at Energies Between 30 and 80 MeV	309
567	A Study of the $\pi^+ + d \rightarrow p + p$ Reaction at Pion Energies 500-200 MeV	312

576	Study of the $(\pi^+, 2p)$ and (π^+, pn) Reactions on the Isotopic Pairs ^{16}O - ^{18}O and ^{40}Ca - ^{48}Ca	318
596	An Experimental Test of Generalized Wheeler-Feynmann Absorber Theory by Direct Observation of Muon-Neutrino Recoil	328
607	Study of Isovector Giant Resonances With Pion Charge Exchange	334

LINE-B

Exp. No.	Experiment Title	Page No.
179	Differential Production Cross Sections of Multiply-Charged Fragments in Proton- and Pion-Induced Spallation of Light Nuclei	108

NEUTRINO A

Exp. No.	Experiment Title	Page No.
24	Search for Pulsed Extraterrestrial Neutrino Sources	16
31	A Neutrino Experiment to Test Muon Conservation	20
38	Neutrino Physics Program: Elastic-Scattering Test of Multiplicative Law, Inverse β Decay	24
53	Observation of the Electron Neutrino at LAMPF	33
148	Neutrino-Electron Elastic Scattering at LAMPF (A Feasibility Study)	89
225	A Study of Neutrino-Electron Elastic Scattering	130
254	Feasibility Study for the Measurement of the Inelastic Neutrino-Scattering Cross Section in ^{39}K	147
559	Search for Neutrino Oscillations	308
609	$\bar{\nu}$ Oscillation Experiments at LAMPF	335

PION PARTICLE PHYSICS (P³)

Exp. No.	Experiment Title	Page No.
32	Precision Measurement of the Processes $\pi^+ \rightarrow \pi^0 + e^+ + \nu$	21
34	Elastic Scattering of π^- on Deuterons	22
36	Radiative Pion Scattering from Hydrogen	23
58	Measurement of $\pi^- p \rightarrow \gamma n$	36
62	Studies of Gamma-Ray Spectra from Reactions Induced by Pions and Protons at LAMPF	40
67	Development of Pion Beam-Monitoring Techniques	43
68	<i>Precise Measurement of the Muon g-2 Value</i>	44
79	Calibration of the Pion Beam Transport Systems and a Pion Beam Monitor	49
80	Forward Elastic Scattering of π^+ and π^- ^{12}C , ^{13}C , ^{16}O , ^{40}Ca , and ^{208}Pb	51
82	Investigation of Pion-Induced Reactions on Light Elements with Three Particles in the Final State	52
90	A Test of the Reversal Invariance in Single-Pion Photoproduction through a Study of Reciprocity in the Reactions $\pi^-^3\text{He} \rightleftharpoons \gamma\text{T}$ and $\pi^+\text{T} \rightleftharpoons ^3\text{He}\gamma$	57
91	Proton Polarization in Radiative π -Proton Scattering at 300 MeV	57
93	Mechanism of $(\pi, \pi\text{N})$ Reactions on Complex Nuclei	59
99	Measurement of the Cross Section for $\pi^- + p \rightarrow \pi^- + \pi^+ + n$ with a Magnetic Spectrometer	61
102	Excitation Functions and Angular Distribution Recoil Studies of Simple Pion-Induced Nuclear Reactions	64
103	Spallation Yield Distributions from Pion Interactions with Complex Nuclei	64
104	Proposal for LAMPF Experiment: Studies of the Proton- and Pion-Induced Fission of Medium-Mass Nuclides	65
110	Below-Threshold Kaon Production Rates with the P ³ Pion Beam	67
118	Fragment Emission from Pion Interactions with Complex Nuclei	71

119	Cross Sections of Simple Nuclear Reactions Induced by Pi-Mesons	72
120	Measurement of the Polarization Asymmetry and the Differential Cross Section of Pion-Nucleon Charge Exchange from 160 to 500 MeV	73
121	Interaction of Stopped Negative Pions with Complex Nuclei	73
123	Nuclear Structure Effects in Pion-Induced Nuclear Reactions	75
132	Measurements of "P," "R," and "A" Parameters in $\pi^\pm$ -p Elastic Scattering	80
144	Search for the C-Violating Decay $\pi^0 + 3\gamma$	87
153	Investigation of Nuclear Gamma Rays Resulting from In-Flight Pion and Proton Reactions	92
154	Elastic Scattering of π^+ and π^- from the Helium Isotopes	93
195	Nuclear Resonance Effect in Pionic Atoms	116
201	The $\pi^+d \rightarrow 2p$ Reaction at 100-500 MeV	119
214	Pionic X-Ray Absolute Yields as a Function of Z	125
221	Precision Measurement of the Decay Rate for the Dalitz Decay Mode of the π^0 Meson	128
222	Measurement of the Decay Rate for $\pi^0 \rightarrow e^+e^-$	129
247	Distributions of Products from Interactions of Stopped π^- with Several Medium- and Heavy-Mass Nuclei	143
248	Study of the $(\pi,\pi N)$, $(\pi\Delta)$, (π,B_Δ) , and (π,N) Reactions in ^3He and ^6Li by Measuring Recoil Spectra	144
283	Charged-Particle Emission Following μ^- Capture	163
286	Proton Axial Tomography	164
287	Studies of Gamma Angular-Ray Spectra and Pion-Gamma Angular Correlations in Scattering of Pions at LAMPF	165
304	Study of the Auger Process in Pionic Atoms	174
309	π^+ and π^- Double-Charge-Exchange Disintegration of ^{16}O , ^{40}Ca , and ^{208}Pb	177
319	Determining the Mechanism for Multinucleon and Cluster Removal in 200-MeV π -Nuclear Interactions	183
320	A Comparison of (π^+,xn) and (π^-,xn) Reactions	184

337	Measurement of the Cross Section for $\pi^-p \rightarrow \pi^-\pi^+n$ at 200 and 229 MeV	192
349	Nuclear Reactions of ^{127}I with Pions	199
358	Elastic Scattering of Pions from Deuterium	203
363	Measurement of $\pi^+ + p$ Elastic Scattering	206
373	A Comparison of Residual Nuclei Yields from π^- Absorption in ^{112}Cd (Ground State) and ^{112}Cd (First Excited State)	213
379	Development of a Muon Polarimeter Using a Stroboscopic Technique	215
390	A Study of Inclusive Inelastic Pion Scattering Near the $\Delta(3/2,3/2)$ Resonance	222
394	Application of Proton-Computed Tomography	224
396	Comparison of Measured Pionic-Atom Cascade Intensities with Theoretical Intensities Obtained Using Parameters from Muonic-Atom Studies	224
404	A Kinematically Complete Study of the $(\pi,\pi'p)$ Reaction on ^{18}O above the Resonance by Detecting Pions and Protons in Coincidence	229
409	A Study of Pion-Induced Cluster Removal	231
416	Study of Fast Pion-Induced Fission of Uranium	235
418	Particle γ -Ray Coincidence Studies from π -Nuclear Reactions	236
420	Development of a High-Resolution Liquid-Argon Charged-Particle Detector of Medium-Energy Particles	238
429	An Investigation of the Anomalous Proton Emission Rate Following π^- Capture in Calcium Isotopes	241
437	Study of Double-Radiative Pion Absorption	245
439	Particle-Gamma-Ray Coincidence Studies from π -Nuclear Reactions	246
453	Survey of Relative Branching Ratios for Radiative Pion Capture on a Series of Isotopes from Low- to High-Z Nuclei	254
455	High-Precision Study of the μ^+ Decay Spectrum	255
458	The Excitation Function for the Single-Charge-Exchange Reaction $^{66}\text{Cu}(\pi^-, \pi^0)^{66}\text{Ni}$	256

459	Cross-Section Measurements of the $^{14}\text{N}(\pi^+, \pi^0)^{14}\text{O}$ (Ground State) Reaction	257
465	Radiochemical Study of Pion Single Charge Exchange	259
466	Nuclear Configuration of Individual Core-Coupled States in ^{209}Bi from Inelastic $\pi^\pm$ Scattering	260
469	Study of the $^{91}\text{Zr}(\pi^+, \pi^0\bar{p})^{90}\text{Z}$ Charge-Exchange Reaction	261
480	Discrete States from Pion Double Charge Exchange on Heavy Nuclei	268
487	Measurement of the Nuclear Resonance Effect in Some Pionic Atoms	271
500	Fission Fragment Distributions in Fast Pion-Induced Fission of ^{238}U	279
513	$\pi^\pm$ Quasi-Free Scattering from the Helium Isotopes	284
515	Measurement of the $t\mu d$ and $t\mu t$ Molecular Formation Rates	285
543	A Product Recoil Study of the $(\pi^\pm, \pi^\pm\text{N})$ Reaction	300
553	Study of Target Thickness Effects in the Cross-Section Measurement of the Pion Single-Charge-Exchange Reaction $^{13}\text{C}(\pi^+, \pi^0)^{13}\text{N}(\text{g.s.})$ from 50 to 350 MeV	305
562	Study of the Pion Absorption Mechanism Through the $\text{A}(\pi, \text{p})\text{X}$ Reaction at $T_\pi = 500$ MeV	310
564	Study of Small Angle $^4\text{He}(\pi^-, \pi^+)$ Reaction	311
595	An On-Line γ -Ray Study of Pion-Induced Single Nucleon Removal Reactions on ^{13}C and ^{48}Ca	328

PROTON IRRADIATION PORT (PIP)

Exp. No.	Experiment Title	Page No.
302	800-MeV Proton Irradiation of an Aluminum Sample	173
327	Proton Irradiation Port (PIP)	187
383	Nickel Irradiation with Protons and Neutrons	217

RADIATION DAMAGE A-1 (RADAMAGE-1)

Exp. No.	Experiment Title	Page No.
302	800-MeV Proton Irradiation of an Aluminum Sample	173

STOPPED MUON CHANNEL (SMC)

Exp. No.	Experiment Title	Page No.
3	Proposal for the Study of Muon Capture γ Rays at the Stopped Muon Channel of LAMPF	2
7	Nuclear Structure Physics Using Stopped Muons	4
11	High-Resolution Studies of Muonic X Rays and Prompt Nuclear Gamma Rays ..	6
12	Muonic X Rays and Nuclear Charge Distributions	7
16	Determination of the Mass of the Muon Neutrino	10
37	Ultrahigh-Precision Measurements of Muonium Ground-State Energy Levels: Hyperfine Structure Interval and Muon Magnetic Moment	23
51	Techniques for Materials Identification and Analysis	32
60	Chemical Effects in the Capture of Negative Mesons in Matter	38
69	Precision Measurements of Muonic X Rays in Low-Z Atoms: Vacuum Polarization and Nuclear Sizes	44
76	Search for Muonium-Antimuonium Transition	48
85	Gamma-Neutrino Correlation after Negative-Muon Capture	54
97	Muon Capture in Gaseous Hydrogen and Deuterium — Measurement of Singlet and Triplet Rates in Hydrogen	61
100	Tissue Chemical Analysis with Mu-Mesic X Rays	63
101	Feasibility Studies: Measurements of Muonic X Rays and Nuclear Gamma Rays with Crystal Diffraction Spectrometers at LAMPF	63
115	Radiochemical Study of Stopped Negative-Muon-Induced Fission	70
122	Pionic-Atom X Rays and Nuclear Distributions	74
142	Negative-Muon-Induced Fission in the Actinide Elements	86
149	Test of Lepton Nonconservation and Assignment Schemes in 1. $\mu^- + (Z,A) \rightarrow (Z-2,A) + e^+$ and 2. $\mu^- + (Z,A) \rightarrow (Z,A) + e^-$	89
152	High-Precision Muonic X-Ray Measurements Using Intrinsic Germanium Detectors	92

155	High-Precision Measurements of Pionic Mass with Crystal Diffraction Spectrometer	93
163	Investigation of Changes in Charge Distributions for Nuclei Near $Z = 28$ by Electron Scattering and Muonic X Rays	99
165	Muonium Formation in Helium and Other Rare Gases	100
166	Muonic X Rays and Nuclear Charge Distributions Electric Quadrupole Moments of $_{67}\text{Ho}^{165}$ and $_{73}\text{Ta}^{181}$	101
172	A Proposal to Measure the Helicity of μ Decay Electrons	104
173	Physics of the Pion and the Pionic Atom	104
175	Search for the Formation of Muonic Helium ($\alpha\mu^-e$)	105
206	Search for the 2S Metastable State of Muonic Hydrogen	122
213	Muon-Transfer Study	125
240	Isotope and Isotone Shifts in the $1f_{7/2}$ Shell	140
250	Investigation of the Use of Stopped Negative Muons for Materials Analysis	146
259	High-Resolution Relative Muonic X-Ray Intensity Measurements from Elemental Targets in the Range $Z = 12-52$	150
266	Trapping of Positive Muons at Defects in Metals	155
268	Measurement of the Ground-State Hyperfine Structure Interval of the Muonic Helium Atom ($\alpha\mu^-e^-$)	156
276	Perturbed Circular Polarization of Muonic X Rays	160
277	Muonic X-Ray Analysis of Core Samples from Oil-Bearing Formations	180
281	Study of Defects in Superconductors Using μ^+	162
283	Charged-Particle Emission Following μ^- Capture	163
288	Studies of μ^- Capture Probabilities for Solid-State Solutions	165
292	Neutron Emission from Muon-Induced Reactions on Actinide Elements	168
297	A Bicentennial Proposal to Study the Behavior of Positive Muons in Solids	171
305	Muon Probe Studies of Magnetic Systems	175
312	Materials Analysis with Muonic X Rays	180

313	Investigation of Magnetism in Actinide Compounds Using μ^+	180
314	Measurement of Temperature Dependence for the Meson-Molecular-Fusion Rate in Deuterium	181
328	Measurement of the Decay Rate and Parity-Violating Asymmetry for $\mu^+ \rightarrow E^+\gamma$	188
329	Sensitive Search for $\mu^- \rightarrow E$ Conversion	188
330	Fundamental Muonic X-Ray Measurement of Interest to Materials Analysis	189
331	Fast Muon Reactions with ^{12}C , ^{46}Ti , and ^{58}Ni	189
334	Nuclear Charge Parameters of ^{41}Ca and the Stable Cadmium and Tellurium Isotopes	191
335	Monopole and Quadrupole Charge Distributions in the Samarium and Gadolinium Isotopes	191
344	Higher Precision Measurement of Muon Magnetic Moment and of Muonium hfs Interval	196
357	Muonic X-Ray Spectra of Gases: I. Density and Admixture Effects	203
364	Search for the Excited 2S State of Muonium	207
371	Muonic X-Ray Spectra of Gases II. Capture Probabilities in Mixtures	212
374	μ^- Capture Probabilities for Selected Solid Binary Compounds	213
375	μSR Study of Diffusion in Metals in the Presence of Paramagnetic Ions	213
377	Investigation of the Effect of Grain Size in Muon Capture in Inhomogeneous Systems	214
382	A μSR Investigation of the Effects of Impurities on the Trapping and Diffusion of μ^+ Particles in BCC Metals	216
400	Search for the Rare Decay $\mu^+ \rightarrow e^+e^+e^-$	227
408	Macroscopic Diffusion Studies in Metals	231
414	Bone Calcium Assay with Muonic X Rays: Signal/Noise and Reproducibility Studies	234
417	Study of the Nuclear Auger Process in Heavy Muonic Atoms	236
421	Sensitive Search for $\mu^- \rightarrow e$ Conversion	238
422	High Precision Measurements of Pionic Mass and Pionic X-ray Energies with a Bent Crystal Spectrometer	239

427	Magnetic Resonance Studies of μ^+ -Electron Defect Complexes in Nonmetals	240
430	A Search for the Effect of Phase Transitions in Atomic Muon Capture	242
435	Muon Spin Rotation in Aluminum	244
436	Negative Muon Spin Rotation and Relaxation in Magnetic Materials	245
444	Search for the Decay $\mu \rightarrow e\gamma$	249
445	Search for the Lepton Flavor Violating Decay $\mu^+ \rightarrow e^+\gamma\gamma$	250
454	Measurement of the Eta Parameter in Muon Decay	254
464	Radiative Muon Capture in Gaseous ^3He	259
491	Experimental Determination of the Strong Interaction Shift in the 2p-1s Transition of Pionic Deuterium and Hydrogen Atoms	273
494	Nuclear Charge Parameters of the Stable Ru and Pd Isotopes	274
499	Muon Longitudinal and Transverse Relaxation Studies in Spin-Glass Systems . .	277
514	A μSR Study of Muonium-Substituted Free Radicals	284
529	Part I. Measurement of the Residual Muon Polarization in ^3He Muonic Atom (A Feasibility Test for Part II), and Part II. Angular Correlations in the Capture of Polarized Muons in Gaseous ^3He	292
547	Search for Fast Muonium in Vacuum	302
552	Ultrahigh Precision Measurements on Muonium	304
571	Muon Spin Rotation Studies of Dilute Magnetic Alloys	315
594	Precision Determination of the Relative Muonic Coulomb Capture Ratios in Oxides of Different Valences	327

SWITCHYARD LINE A BEAM STOP (SWY-LABS)

Exp. No.	Experiment Title	Page No.
105	Nuclear Spectroscopy Studies of Proton-Induced Spallation Products	65
118	Fragment Emission from Pion Interactions with Complex Nuclei	71
269	800-MeV Proton Irradiation of Metal Samples	157
381	Alumina Ceramic Radiation-Effects Study	216

THIN TARGET AREA (TTA)

Exp. No.	Experiment Title	Page No.
86	Counter Experiments in the Thin Target Area	54
308	An attempt to Make Direct Atomic Mass Measurements in the Thin Target Area	177

Exp. 192

MEASUREMENT OF THE EMITTANCE GROWTH IN H^- STRIPPING

LASL

T. D. Hayward, Spokesman

E. A. Knapp, G. P. Lawrence, R. F. Bentley

The purpose of this experiment is to measure the small-angle scattering that results from the stripping of an 800-MeV H^- beam in a thin material stripper.

This will be done by preparing a supercollimated H^- beam and then passing it through a suitable stripping target. The angular divergence of the beam will be determined by the beam image recorded on a photographic plate located 50-m downstream from the stripping target.

Exp. 193

**MEASUREMENT OF SMALL-ANGLE NEUTRON ELASTIC
SCATTERING FROM PROTONS**

University of New Mexico

B. D. Dieterle, Spokesman

J. Donahue, C. P. Leavitt, D. M. Wolfe, T. Rupp, R. Carlini, W. Thomas, J. Valentine,
C. Gregory

Temple University

W. K. McFarlane, Spokesman

L. B. Auerbach, V. L. Highland, K. F. Johnson, H. Balshem

LASL

R. F. Bentley, J. Pratt

We propose to measure the neutron-proton differential cross section at neutron lab angles from 2.5 to 2.7° , covering the C.M.S. angular range of about 5 to 65° . Angular resolution will be $\gtrsim 0.3^\circ$. Accuracies expected are $\pm 1\%$ statistical and $\pm 3\%$ absolute. Energies desired are 500, 650, and 800 MeV, in order to complement other data at larger angles.

Elastically scattered neutrons will be distinguished from inelastically scattered neutrons using a neutron time-of-flight detector. For this experiment, it has the advantage that no intermediate calibration need be made to correct for inelastic effects. The well-defined neutron beam ($\delta E \gtrsim 10$ MeV) and the beam-chopping capability made time-of-flight measurement possible.

The experiment is proposed for the existing 0° neutron beam line in Area B. The total running time requested is 220 h at an average H^- beam of 2μ .

Exp. 194

P-P, D, R, AND A MEASUREMENTS

Case Western Reserve University

P. R. Bevington, Spokesman

H. W. Baer, F. H. Cverna, H. B. Willard, M. W. McNaughton, E. Winkelman

Virginia Polytechnic Institute and State University

L. D. Roper, R. A. Arndt

Texas A&M University

R. A. Bryan

State University of New York, Geneseo

J. R. Chen

LASL

R. R. Stevens, Jr., E. P. Chamberlin

Fermi Laboratory

P. A. Thompson

University of Idaho

H. Willmes

University of California, Davis

N. King

The goal of these experiments is to measure the Wolfenstein "triple-scattering" parameters for the elastic scattering of protons by protons at incident energies of 400-800 MeV. These parameters include the depolarization $D(\theta)$ and $A(\theta)$.

Measurements will be performed with an incident polarized beam of protons from the polarized ion source and analysis of the final polarization through scattering by protons. Identification of purely elastic scattering will be made by detection with MWPCs of forward- and conjugate-scattered protons from the first analyzer, momentum analysis of the conjugate-scattered protons from the first scattering, and dE/dx and time-of-flight analysis with scintillation detectors.

Initially, the depolarization $D(\theta)$, with spins perpendicular to the planes of scattering, will be studied over the laboratory angle range from 10 to 70° (approximately 25 to 145° in the center of mass). Later measurements of the rotation parameters over the same angular range will require only slight modifications to the detection equipment. The running time needed will depend on the availability of incident polarized proton beams at energies below 800 MeV.

The proposed program constitutes part of a long-range effort to study the proton-proton interaction in more detail and higher precision than is now available. It will complement measurements of the polarization-transfer parameters $D_t(\theta)$, $R_t(\theta)$, and $A_t(\theta)$ of Exp. 160, measurements of the differential cross section $\sigma(\theta)$, polarization $P(\theta)$, and spin-correlation parameters $A_{yy}(\theta)$, etc., of Exp. 27, as well as measurements of the neutron-proton and pion-nucleon interaction that are to be carried out concurrently by other groups at LAMPF.

Exp. 195

NUCLEAR RESONANCE EFFECT IN PIONIC ATOMS

LASL

M. Leon, Spokesman

J. N. Bradbury

University of Mississippi

J. J. Reidy, Spokesman

The experiment consists of comparing the pionic x-ray intensities from an "interesting" isotope with those from a reference isotope of the same element. An "interesting" isotope is one for which a significant attenuation of one or more mesic atom x-ray lines, because of the nuclear resonance effect, is predicted. Observations of pionic x rays from ^{110}Cd and ^{111}Cd yielded attenuations which are in good agreement with theoretical predictions. It is proposed that the experiment be extended to include several other physically interesting isotopes. In particular, observation of

Using the HRS facility, we propose to extend the region of four-momentum transfer, $-t$, investigated at 800 MeV, by a factor of 12 over the existing measurement from the ZGS by measuring the polarization of 180° [$-t = 4.3 \text{ (GeV/c)}^2$]. It has been possible to estimate the count rates with reliability because of the existence of differential cross-section measurements at 800 MeV at backward angles (Goldzahl, Saclay, 1975), and using the beam intensities expected from the LAMPF polarized source in a 50-50 shared mode of running with Area B (initially, 2-1/2 to 10 nA, 20 nA after the source and peripheral equipment is completely developed).

Exp. 308

**AN ATTEMPT TO MAKE DIRECT ATOMIC MASS MEASUREMENTS
IN THE THIN TARGET AREA**

Lawrence Berkeley Laboratory

A. M. Poskanzer, Spokesman

D. J. Vieira

LASL

G. W. Butler, Spokesman

D. G. Perry

Texas A&M University

J. B. Natowitz

Oak Ridge National Laboratory

F. Plasil

Brookhaven National Laboratory

L. P. Remsberg

It is proposed to attempt to make direct atomic mass measurements of nuclei far from beta stability to an accuracy of the order of 100 keV by time-of-flight and energy measurements. The neutron-excess isotopes of the low-Z elements produced as fragments from uranium would be studied. In addition, it is planned to search for new neutron-deficient isotopes produced as spallation residues from a calcium target.

Exp. 309

**INCLUSIVE π^- AND π^+ DOUBLE CHARGE EXCHANGE
ON ^{16}O AND ^{40}Ca**

University of Wyoming

G. A. Rebka, Jr., Spokesman

Colorado College

C. Bordner

LASL

P. A. M. Gram

Observation of pion double charge exchange presents an unusual opportunity to study double, and higher order scattering in nuclei since at least two nucleons must somehow interact in the process due to conservation of charge. We expect to measure the doubly differential cross section

for inclusive pion double charge exchange, both (π^+, π^-) and (π^-, π^+) for ^{16}O and ^{40}Ca at five incident energies in the vicinity of possible Δ resonance production (120, 150, 180, 210, and 240 MeV). For each nucleus, sign of charge, and energy, we expect to measure at five angles (20, 50, 80, 110, and 130°) and for each angle, at 9 or 10 energies evenly spaced over the allowed spectrum of the scattered pion. Most of these measurements should have 5% accuracy limited mainly by the normalization and instrumental uncertainties; about 20% of the measurements should have 8 to 15% accuracy limited by the counting statistics. The resulting collection of data should be sufficient to engender serious theoretical interest and, with a degree of luck, to establish the matrix elements effective in pion double charge exchange in this important energy range.

We shall detect inclusive pion double charge exchange with the magnetic spectrometer and associated instrumentation designed and used for detecting $\pi^- p \rightarrow \pi^- \pi^+ n$ in Experiments 99 and 337, a similar experimental problem. This spectrometer system combined with P^3 is extremely well suited to such applications and may be characterized by the following properties: (1) full P^3 intensity, (2) filtering opposite charges well, (3) small detectors, (4) constant 15-msr acceptance and 9.5% momentum bite, (5) short flight path, and (6) 60 MeV/c pions or lower.

NUCLEAR CHARGE PARAMETERS OF ^{44}Ca AND THE STABLE CADMIUM AND TELLURIUM ISOTOPES

LASL

E. B. Spera and H. D. Wohlfahrt, Spokesmen

M. V. Hoehn (Florida State University), Y. Yamazaki

University of Mainz

G. Fricke

University of British Columbia

R. Hayano

Oregon State University

K. S. Krane

Princeton University

R. Sherr

Purdue University

R. M. Steffen

It is proposed to determine the charge radii of ^{44}Ca and a sequence of stable cadmium and tellurium nuclei by measurement of the muonic x-ray spectra. These new data will extend the region studied in Exps. 163 and 240, and should be helpful in understanding the systematic features of the isotope/isotone shifts observed in those experiments. The new information will be compared with recent or planned optical isotope shift measurements in these nuclei and, hopefully, will be useful in illuminating the discrepancy in ^{44}Ca that exists between muonic and optical results that use high-resolution tunable dye laser techniques. The muonic 2s states will be included in the cadmium and tellurium charge parameter study to investigate the validity of theoretical nuclear polarization corrections in $Z \approx 50$ mass region.

MONOPOLE AND QUADRUPOLE CHARGE DISTRIBUTIONS IN THE SAMARIUM AND GADOLINIUM ISOTOPES

LASL

E. B. Spera and Y. Yamazaki, Spokesmen

M. V. Hoehn (Florida State University), H. D. Wohlfahrt

Oregon State University

K. S. Krane

Purdue University

R. M. Steffen

Indiana University

J. G. Wills

It is proposed to determine the charge-distribution parameters of a series of samarium and gadolinium nuclei by measurement of the muonic x-ray spectra. These data will extend the results of Exp. 7 and will be helpful in understanding the systematics of nuclear structure in the gadolinium transition region. Recently developed model-independent analysis methods will be used in analyzing the new data. Isomer shifts of low-lying nuclear states will be measured and, in

particular, the isomer shift of the 0^+ beta-band head will be determined in those nuclei in which it is observably excited.

Exp. 336

STUDY OF THE SPIN DEPENDENCE OF PROTON-PROTON PION PRODUCTION REACTIONS

Rice University

G. S. Mutchler, Spokesman

G. C. Phillips, I. M. Duck, S. D. Baker, M. Furic, J. B. Roberts, and J. M. Clement

University of Houston

L. S. Pinsky, Spokesman

E. V. Hungerford, B. W. Mayes, and T. M. Williams

LASL

C. F. Hwang

The spin dependence of the reactions $pp \rightarrow d\pi^+$ and $pp \rightarrow \Delta^{++}n$ will be investigated with a transversely polarized 800-MeV proton beam. Complete kinematical information will be obtained by detecting scattered particles in coincidence in a magnetic spectrometer arm and a time-of-flight arm. The asymmetries for these reactions will be measured to an accuracy $\Delta A \lesssim 0.01$ for pion c.m. angles between 35° and 110° in $p\bar{p} \rightarrow d\pi^+$, and Δ^{++} c.m. angles between 0° and 115° in $p\bar{p} \rightarrow \Delta^{++}n$. Such measurements provide valuable information on the relative importance of the various exchange mechanisms involved in pion production.

Supplement to Proposal 336/33.

The asymmetry in the reaction $\bar{p} + p \rightarrow p\pi^+n$ has been measured in a kinematically-complete experiment during Phase 1 of Exp. 336/33, "Study of the Spin Dependence of Proton-Proton Pion Production Experiments." The data revealed unexpectedly large asymmetries with striking angular dependence. This supplement is a request for additional energies to measure an excitation curve of the cross section and asymmetries for large momentum transfer in the reaction $\bar{p}p \rightarrow p\pi^+n$ ($\theta_\Delta = 90^\circ$). Such an excitation curve should be sensitive to the proposed 1D_2 dibaryon resonance at $\sqrt{s} \sim 2175$ MeV ($T_B \sim 650$ MeV). As the resonance is thought to be 50- to 100-MeV wide, 50-MeV steps were chosen.

Beam Parameters: EPB - 20- to 200-pA transverse polarized protons, on liquid hydrogen. $T_B = 500, 550, 600, 650, 700,$ and 750 MeV.

Exp. 337

MEASUREMENT OF THE CROSS SECTION FOR $\pi^-p \rightarrow \pi^-\pi^+n$ AT 200 AND 229 MeV

University of Wyoming

Glen A. Rebka, Jr., Spokesman

C. W. Bjork, A. R. Kunselman, M. Manley, J. Walter

LASL

P.A.M. Gram, Spokesman

Colorado College

C. Bordner

Massachusetts Institute of Technology

E. Lomon

North Carolina State University

R. Carawon

We propose to measure the doubly differential cross sections $d^2\sigma/d\Omega^*dT^*$ for positive pions produced in the reaction $\pi^-p \rightarrow \pi^-\pi^+n$ at incident energies of 200 and 229 MeV, which are very near threshold, and to deduce from these the total production cross sections. A double-focusing magnetic spectrometer whose "optical" properties define the sign, momentum, and angle of scattering of a charged particle will identify positive pions produced in a liquid-hydrogen target. The target flask, flight path in the spectrometer, and array of detectors will be in a common vacuum to minimize loss of energy and multiple scattering of pions produced with extremely low momenta, and, hence, to maximize the accessible portion of $T^*\text{-}\cos\theta^*$ phase space. Accuracies of 5% in the total production cross sections and 10% in the doubly differential cross sections should be achieved by this experiment.

From the two proposed measurements and our previous results between 229 and 356 MeV, we will extract the soft-pion contribution to the total cross section. The new measurements nearer threshold will greatly improve the reliability of extrapolation to threshold and, hence, the validity of comparison to soft-pion theory. We shall accurately determine ξ , the parameter that distinguishes among diverse effective Lagrangians, as well as a_0 and a_2 , the S-wave $\pi\pi$ -scattering lengths for isospin 0 and 2. The doubly differential cross sections will not only facilitate extraction of the soft-pion contribution, but will also yield hitherto unavailable information about the hard-pion contribution.

Exp. 338

**MASS MEASUREMENTS OF EXOTIC NEUTRON-RICH NUCLEI
USING THE (π^-, π^+) REACTION**

University of Texas

W. J. Braithwaite, *Spokesman*

W. B. Cottingame, C. F. Moore

LASL

C. L. Morris, H. A. Thiessen

We are proposing to measure the masses of four exotic neutron-rich nuclei, $^{16,17,18}\text{C}$ and ^{48}Ar , using the (π^-, π^+) double-charge-exchange reaction on targets of $^{16,17,18}\text{O}$ and ^{48}Ca , respectively.

Carbon-16 is the most neutron-rich carbon isotope whose mass has been measured, and its determination in this experiment will provide an independent energy calibration for the other mass determinations. Further, this measurement is necessary to correct for the small ^{16}O contaminant in the ^{17}O target, used in the determination of the mass of ^{17}C .

Argon-48 is +8 neutrons from stability and +2 neutrons away from the most neutron-rich argon isotope whose mass has been measured. At present, no in-beam mass measurements have been made of nuclei +8 neutrons from stability exploiting two-body kinematics in the description of the final state.

The EPICS spectrometer will be used to measure the energy of positive pions emerging at 10° (lab), and the EPICS channel will be used to provide negative pions for the DCE measurement. Elastic scattering of $\pi^+ + {}^2\text{H}$ at several scattering angles will be used to calibrate the spectrometer, with the channel magnets exactly reversed to provide the positive pions for this calibration.

Exp. 339

SURVEY OF PHOTODETACHMENT CROSS SECTION OF H^- FROM THRESHOLD TO 15 eV AND ITS DEPENDENCE UPON ELECTRIC FIELD

University of New Mexico

H. C. Bryant, Spokesman

J. Donahue, H. Sharifian, H. Tootoonchi, D. Clark

LASL

P.A.M. Gram, Spokesman

J. C. Pratt, M. A. Yates-Williams

The work on photodetachment resonances in H^- , completed in Exps. 200 (November 1976) and 323 (March 1977), revealed a much richer structure than had been anticipated. In Exp. 200, we unexpectedly found a resonance of the Feshbach type, as well as the shape resonance we had set out to study. In Exp. 323, we discovered that, contrary to theoretical expectation, the Feshbach resonance showed a marked Stark splitting, *linear* in the field, whereas the shape resonance was extremely resistant to perturbation. These resonances are associated with the $n = 2$ state of neutral hydrogen.

In this proposal, we outline our plans to increase the energy range of our measurements in order to look for resonances associated with the higher states of the hydrogen atom, with and without a barycentric electric Stark field. In addition to the insight its perturbation gives into the wave functions of allowed transitions (${}^1\text{P}$ states), the electric field is expected to make possible transitions to states forbidden in the field-free case. Our ability to apply large barycentric electric fields to H^- is unique to the relativistic beam technique, and opens up a new dimension in H^- spectroscopy.

The experimental arrangement will be similar in concept to that which we have used earlier; counting rates and signal-to-noise ratios will be increased somewhat. The source of higher frequency light will be a "YAG" (neodymium-doped yttrium-aluminum-garnet) laser, directed through two nonlinear crystals ("frequency doublers") to produce 4.68-eV photons ($4 \times$ the YAG energy). The optical bench and scattering chamber assembly will be rebuilt to be a single rigid unit, and additional beam-scanning equipment will be installed. We are, in short, building a Mark II version of the experiment based on our experience and on the revelation of the interesting physics that remain to be done with this technique.

Exp. 447

**MEASUREMENT OF NEUTRON AND PROTON TRANSITION MATRIX
ELEMENTS IN ^{138}Ba BY COMPARISON OF π^+ AND π^-
INELASTIC SCATTERING**

LASL

H. A. Thiessen, Spokesman

J. F. Amann, C. L. Morris

Michigan State University

S. M. Austin

University of Colorado

R. L. Boudrie

We proposed to use the EPICS facility to measure pion inelastic scattering to the first two excited states of ^{138}Ba . By comparison of the strength of excitation with π^+ and π^- we will deduce both the effective charge (effective proton number) and effective neutron number of these transitions. For the following reasons ^{138}Ba is a particularly good choice for such work: it has previously been studied with electromagnetic proton and alpha probes, the first few levels are easily resolved, a large isotopically pure target can be fabricated at modest cost, and detailed shell-model calculations are available for this nucleus.

Exp. 448

**A STUDY OF π^+ DOUBLE-CHARGE-EXCHANGE SCATTERING AT
SMALL ANGLES ON VARIOUS NUCLEI**

New Mexico State University

G. R. Burleson, Spokesman

G. S. Blanpied

LASL

C. L. Morris, H. A. Thiessen

University of Texas, Austin

C. F. Moore, W. J. Braithwaite, H. Ward

We propose to measure cross sections for the double-charge-exchange scattering (DCX) of π^+ on various nuclei at small angles. We will use a modification of the EPICS spectrometer system that is currently being set up for Exp. 310. This involves installing a circular dipole magnet on the spectrometer frame that will separate the π^+ beam from the scattered π^- at small angles, thus reducing the background in the front wire chambers and allow for small-angle measurements.

The aim of the experiment is to produce data that will help to improve our understanding of the DCX process. We propose to take most of the data at a single beam energy over the angular range ($0^\circ \lesssim \theta \lesssim 20^\circ$) with four targets, and to use one of these targets to measure an excitation function at 0° over the (3,3) resonance. The DCX reaction is poorly understood from a theoretical point of view. We believe it would be better to make a final selection of targets at a future time when more will be known about the process, rather than to commit ourselves to particular ones now. Our request is for 400 h of beam time at a proton current equivalent to $720 \mu\text{A}$.

SURVEY OF THE SINGLE AND DOUBLE PHOTODETACHMENT CROSS SECTION OF THE H⁻ ION FROM 14 TO 21.8 eV

University of New Mexico

H. C. Bryant, Spokesman

K. B. Butterfield, D. A. Clark

LASL

J. B. Donahue, Spokesman

C. A. Frost, P.A.M. Gram, M. A. Hamm, R. W. Hamm

University of Connecticut

W. W. Smith

We propose to use our colliding-beam method to measure the cross section for the double-photodetachment reaction

from threshold at 14.15 to 21.8 eV. To our knowledge, this cross section has never before been measured.

The colliding-beam method, which exploits the Doppler shift due to the relativistic H⁻ ions, has been demonstrated in LAMPF Exps. 200 and 323. The results of these experiments have been published.

The present experiment will make use of the new scattering chamber designed for LAMPF Exp. 339. A permanent magnet is used to separate the H⁺ and H⁰ formed by gas stripping the H⁻ beam during the long-beam transport. The photon beam from an ArF excimer laser then intersects the H⁻ beam. A second permanent magnet recombines the beams at the Faraday cup and simultaneously bends the positive ions into a scintillator hodoscope. The signature for double photodetachment is then a count in the hodoscope in coincidence with the laser flash.

We will also measure the cross section from the single-photodetachment reaction

The electron signal in a solid-state detector and the H⁰ signal in the hodoscope in coincidence with the laser flash will be the signal for single photodetachment. The single-detachment cross section has also never been measured in this energy region.

We plan to run for approximately two weeks (336 h) exclusive of set-up time. This time includes an efficiency factor of ~60%. About half of this time would be spent on a systematic mapping of the available energy region and about half would be spent studying the threshold behavior of reaction (1).

Parameters: polarized "decay" μ^- beam, intensity $\simeq 60$ kHz, momentum 30 MeV/c, momentum bite 8%, spot size $\simeq 5$ cm by 12 cm, maximum available duty cycle. Purity $e^-/\mu^- \simeq 1/1$ or better.

H⁻ MAGNETIC STRIPPING RATES**LASL***A. J. Jason, Spokesman*

D. W. Hudgings and D. A. Clark

The rate at which H⁻ atoms undergo magnetic stripping at fields from one to two tesla is of interest to accelerator technology. In particular, rate information is needed in order to design the injection system for the proton storage ring currently under construction at AT-3 for the WNR facility.

Measurements are to be made by passing a beam of countable intensity through a spatially varying magnetic field. The particles stripped by the field will undergo a deflection which can be related to the stripping rate. Useful data are expected over the range of 0.5 tesla to about 1.8 tesla representing a rate variation of more than six orders of magnitude.

EXCITATION OF UNNATURAL PARITY STATES IN ¹²C AT 500 MeV**Rutgers University***C. Glashausser, Spokesman*

S. Nanda

LASL*J. M. Moss, Spokesman*

G. W. Hoffmann, W. D. Cornelius

University of California, Los Angeles

G. J. Igo, C. A. Whitten, Jr.

University of Minnesota

N. M. Hintz, M. A. Franey, M. Gazzali

The HRS will be used to study inelastic proton scattering primarily to the 12.71 MeV, 1⁺, T = 0 and 15.11 MeV, 1⁺, T = 1 states in ¹²C at 500-MeV incident energy. Cross sections will be measured over the range 2.5 to 35° (q about 0.2 to 3 fm⁻¹); analyzing powers will extend from 2.5 to 20°. The aim is to look for evidence of precritical pion condensation (critical opalescence) and to verify spin-dependent Glauber and KMT calculations in an energy region where phase shifts are quite well determined. One-hundred hours of polarized beam and 100 h of unpolarized beam are requested.

Exp. 532

**MEASUREMENTS OF CROSS SECTIONS AND ANALYZING POWER
IN THE (p,2p) REACTION ON DEUTERIUM**

University of Pennsylvania

S. Frankel, Spokesman

W. Frati

LASL

O. B. van Dyck

College of William and Mary

C. F. Perdrisat

The purpose of this experiment is to study the (p,2p) reaction of 800-MeV protons with deuterium using a polarized beam.

The experiment differs from previous experiments in several ways:

- A. the use of polarized protons so that an important extra constraint will be available in the analysis of the basic p-d reaction, and,
- B. the study of the reaction in the conventional kinematic region dominated by the quasifree process, the low t ($0.1 \text{ GeV}/c^2$) high- k region (up to $800 \text{ MeV}/c$) dominated by the spectator process, and in the interference region.

The experiment will use the HRS in coincidence with the LRS to provide overconstrained data in the high internal momentum (backward proton) low-rate region and a time-of-flight hodoscope in the (forward) conventional region (equal angle geometry).

One purpose of the experiment is to provide complete data that can form a basis for understanding the high internal momentum wave function for the deuteron. Another purpose is to obtain empirical data on backward proton production that can serve as input to cluster theories of the backward production of protons from heavy nuclei.

Exp. 533

THE ASYMMETRY IN THE (p, π) REACTION ON ${}^6\text{Li}$ AT 800 MeV

The Gustaf Werner Institute, Uppsala, Sweden

B. Höistad, Spokesman

Northwestern University

K. K. Seth, Spokesman

S. G. Iversen, M. O. Kaletka

LASL

G. W. Hoffmann

We propose to study the asymmetry in the (p, π) reaction at 800 MeV using the HRS spectrometer facility. The existing 800-MeV data on the (p, π) reaction show many interesting characteristics not observed at low energies. It is however not easy to associate these characteristics with a simple reaction mechanism. It is therefore necessary to include measurements which are sensitive to the reaction mechanism. Such information can hopefully be obtained from a study of the asymmetry in the (p, π) reaction. At high energy no asymmetry data exists for targets with $A > 2$. Recent studies of the $\bar{p}p \rightarrow \pi^+d$ and the $p^2\text{H} \rightarrow \pi^+{}^3\text{H}$ reactions show large differences in the analyzing power, indicating a possibility that the reaction mechanism is different in the two cases. We want to extend these measurements to a light nucleus, ${}^6\text{Li}$. With

the improved intensity of the polarized beam, which is expected to be available by the Fall of 1980, (≥ 5 nA on target at HRS) it is possible to measure the asymmetry in the ${}^6\text{Li}(p,\pi){}^7\text{Li}$ reactions for several transitions within a reasonable time (240 h). Due to the relatively large differential cross section in this reaction, the measurements can be done in a large angular interval ($\theta_{\pi}^{\text{cm}} \approx 5\text{-}60^\circ$) which is very important for the interpretational work.

Exp. 534

MEASUREMENT OF $\bar{p}$ -p AND $\bar{p}$ -d ELASTIC SCATTERING IN THE COULOMB INTERFERENCE REGION BETWEEN 500 AND 800 MeV

University of California, Los Angeles

G. Pauletta and J. B. McClelland, Spokesmen

M. Bleszynski, G. J. Igo, B. Aas, C. A. Whitten, Jr.

University of Minnesota

M. Gazzaly

We will measure the differential cross section and asymmetries for p-p and p-d scattering and the Wolfenstein parameters D , R , A , R' , and A' for p-p scattering at energies ranging between 500 to 800 MeV, and at angles ranging between 0 and 13° in the laboratory.

The measurement will be performed in Line C, using the HRS spectrometer with the standard counter assembly at the focal plane in the small angle mode for part of the experiment and use the focal-plane polarimeter for the remainder. The experimental method for the small-angle mode has been established in the course of Exp. 15. Feasibility for this part of the experiment depends on the excellence of the beam handling conditions in Line C, and on the momentum resolution of HRS.

A number of measurements between 500 and 800 MeV would be quite interesting. At 500 MeV, Bugg et al. (TRIUMF) have measured the triple scattering parameters D , R , and R' as well as the asymmetry with high statistical accuracy. Besset et al. (SIN), have measured D , R , A , and P and the overlapping quantities agree well. In addition, Aebischer et al. have measured P and $d\sigma/dt$ at 500 MeV. Thus, our 500-MeV measurements will suffice as a check of our consistency with the results of these other groups.

Between 600 and 800 MeV the data are sparse and most have large errors. We will fill this gap, in 50-MeV intervals, with measurements at small t , of six independent observables of great importance in our understanding of the energy dependence of the NN interaction.

Exp. 535

A STUDY OF THE RELATION BETWEEN THE (p,d) AND (π ,p) REACTION IN A PION EXCHANGE MODEL

LASL

R. E. Anderson, Spokesman

R. L. Boudrie, E. W. Hoffman, R. J. Macek, C. L. Morris, H. A. Thiessen, and M. J. Leitch

The Gustav Werner Institute, Uppsala, Sweden

B. Höistad, Spokesman

We propose to measure angular distributions for transitions in the ${}^{16}\text{O}(p,d){}^{16}\text{O}$ reaction at 597 MeV using the HRS facility. By using a thin ice target a number of individual levels will be clearly resolved in ${}^{16}\text{O}$. This measurement is intended to elucidate the relationship between the (π ,p)

and (p,d) reaction in terms of a pion exchange model suggested by Wilkin. By using $^{16}\text{O}(\pi, p)^{16}\text{O}$ data at an energy required by Wilkin's model (165 MeV) we will examine whether the (π, p) can be considered as a subprocess to the (p,d) reaction at energies above the pion production threshold.

A separate proposal is submitted to study the $^{16}\text{O}(\pi, p)^{16}\text{O}$ reaction at $T_\pi = 165$ MeV using the EPICS facility.

Exp. 536

EFFICIENCY MEASUREMENTS FOR THE π^- IDENTIFICATION IN THE PLASTIC BALL DETECTOR

Lawrence Berkeley Laboratory

Hans H. Gutbrod, Spokesman

H. G. Ritter, F. Weik, T. Warwick, M. R. Maier, and H. Wieman

We are presently building a 4π (98%) multidetector system for the study of central and violent relativistic nuclear collisions at the Bevalac. The detector under construction is called the Plastic Ball Spectrometer and consist of 815 Δ E-E detector modules with a 4 mm Δ E - CaF_2 detector and a 36-cm-long plastic scintillation E-detector. The particle identification measured with a prototype allowed clear separation of p, d, t, ^3He , and ^4He . The π^+ identification is achieved via delayed coincidence with the e^+ from the $\mu^+ \rightarrow e^+$ decay. For proper π^+ identification it is necessary to calibrate the detector with a π^+ beam of known momentum. The scattering out into neighbor detectors and the efficiency of the e^+ tagging has to be established. Three energies at the LEP facility at 50, 80, and 110 MeV π^+ will provide these necessary data. A time-of-flight plastic scintillator telescope in front of our detector cluster of 11 detectors identifies the π^+ entering the center-detector. The response of the center-detector and the cross-talk to the surrounding detectors can then clearly be established. Berkeley has no LEP facility.

Exp. 537

A STUDY OF THE RELATION BETWEEN THE (π, P) AND (p, d) REACTION IN A PION EXCHANGE MODEL

LASL

R. E. Anderson Spokesman

R. L. Boudrie, E. W. Hoffman, R. J. Macek, C. L. Morris, H. A. Thiessen, M. J. Leitch

The Gustaf Werner Institute, Uppsala, Sweden

B. Höistad, Spokesman

We propose to measure angular distributions for the $^{16}\text{O}(\pi^+, p)^{16}\text{O}$ reaction at $T_\pi \approx 165$ MeV. Using the EPICS facility, a resolution of about 400 keV is anticipated and a number of individual levels will be clearly resolved in ^{16}O .

We intend to elucidate the connection between the (π^+, p) and (p, d) reactions which has been suggested by Wilkin, and which has been borne out by our earlier studies of the $^{12}\text{C}(\pi^+, p)^{12}\text{C}$ reaction.

While exact finite range DWBA calculations satisfactorily explain the $^{12}\text{C}(p, d)$ results, the $^{16}\text{O}(p, d)$ results are badly overpredicted. We will discover if the $^{16}\text{O}(p, d)$ data can be phenomenologically described based on the (π, p) data.

A separate proposal is submitted for a study of the (p, d) reaction on ^{16}O at 597 MeV utilizing the HRS facility.

Exp. 538

**ANALYZING POWER AND CROSS-SECTION MEASUREMENTS
OF THE ${}^4\text{He}(\bar{p},d){}^3\text{He}$ REACTION**

University of Colorado

J. R. Shepard, Spokesman

T. G. Masterson, M. Rayman

LASL

N. S. P. King, Spokesman

R. L. Boudrie, R. E. Anderson

University of California, Los Angeles

G. J. Igo, C. A. Whitten, Jr.

Indiana University

W. W. Jacobs

We propose to measure differential cross sections and analyzing powers for the ${}^4\text{He}(\bar{p},d){}^3\text{He}$ reaction at $T_p = 550, 650, \text{ and } 800 \text{ MeV}$ using the HRS facility. These will provide the first $(\bar{p},d)$ reaction analyzing power measurements above 400 MeV . The data will be useful in testing various reaction models as a function of bombarding energy. Specifically, they will allow a check of recent calculations which show that reasonable agreement with cross-section data depends on using a $n-{}^3\text{He}$ wave function extracted from $e^- + {}^4\text{He}$ elastic scattering data *after* meson exchange current contributions are subtracted. The proposed measurements are an integral part of a program intended to cover the entire intermediate energy region from roughly $200\text{--}800 \text{ MeV}$. This is the range of bombarding energies over which intermediate meson (p,d) reaction modes are expected to become important relative to the simple single-step process dominate at lower energies.

Exp. 539

SEARCH FOR PURE NEUTRON/PROTON TRANSITIONS IN ${}^{14}\text{C}$

LASL

H. W. Baer, Spokesman

J. F. Amann, R. E. Anderson, C. L. Morris, H. A. Thiessen

University of Texas, Austin

D. B. Holtkamp, Spokesman

S. J. Greene

University of Minnesota

D. Dehnhard, S. J. Tripp

Oak Ridge National Laboratory

Charles D. Goodman

A study of the nucleus of ${}^{14}\text{C}$ with inelastic pion scattering is proposed to search for pure neutron or proton transitions to excited states. On the basis of previous studies of ${}^{12}\text{C}$ and ${}^{13}\text{C}$ it is believed that inelastic pion scattering furnishes a uniquely selective tool for such studies. It is proposed that the experiment be run at an energy which provides direct comparisons with the ${}^{12}\text{C}$ and ${}^{13}\text{C}$ results. Elastic scattering cross sections from this study will be used to interpret the single charge-exchange results on ${}^{14}\text{C}$, an experiment already approved to run.

ELASTIC SCATTERING FROM LIGHT NUCLEI

University of California, Los Angeles*G. J. Igo and M. Bleszynski, Spokesmen*

B. Aas, J. B. McClelland, C. W. Whitten, Jr., G. Pauletta, (Staff); M. Hajisaeid, F. Irom, A. Rahbar, A. T. M. Wang (Students)

LASL

W. D. Cornelius

We propose measurements of the elastic scattering and observables for the light nuclear targets, ^2H and ^3He . The momentum transfer range will extend out to $1(\text{GeV}/c)^2$, appropriate for scheduling in the summer of 1980 (variable energy cycle) and immediately thereafter. Specifically $d\sigma/dt$, P , and the Wolfenstein parameters will be measured. In the case of ^2H , this is part of a substantial series of measurements begun at the ZGS and at the Cosmotron at 1.0, 0.8, and 0.6 GeV. Other observables, requiring vector and tensor polarized deuterium beams are being proposed at the Laboratoire National Saturne.

A SEARCH FOR NUCLEAR CRITICAL OPALESCENCE USING
THE REACTION $^{40}\text{Ca}(\pi^+, 2\gamma)$ **LASL***M. D. Cooper, Spokesman*

R. E. Anderson, H. W. Baer, J. D. Bowman, R. L. Burman, C. M. Hoffman, W. W. Kinnison, M. J. Leitch

Tel Aviv University

J. Alster, A. Doron, A. Ereil, M. A. Moinester

University of Louvain, France

J. Deutsch, G. Gregoire, R. Prieels

Nuclear critical opalescence will be searched for in the energy inclusive reaction $^{40}\text{Ca}(\pi^+, 2\gamma)$ at $T_\pi = 55$ MeV. The double differential cross section $d^2\sigma/dqdx$ will be measured for values of the energy-sharing parameter $-0.9 < x < 0.9$ and for values of the momentum transfer $0.5 < q < 2.0m_\pi$. The measurements will employ the LAMPF π^0 -spectrometer to detect the γ -rays in a kinematical region forbidden to π^0 s. Supplementary beam counters will aid in the suppression of backgrounds. In thirty days of data acquisition, it will be possible either to observe a substantial enhancement due to the opalescence or to establish that the opalescence enhancement is less than the theoretical uncertainty in calculating the reaction.

Supplement to Proposal 541

This summary should be considered as providing supplementary information to the original proposal and should be read in conjunction with it. This document contains a brief summary of important points from the proposal. The formalism for a theoretical calculation of the cross section and opalescence effects is described. Progress in the development of the beam counters is reported.

**FEASIBILITY STUDY: USING AN EXISTING NEUTRON BEAM PIPE
AT LAMPF BEAM STOP FOR CRYSTAL DIFFRACTION
SPECTROMETER EXPERIMENTS**

Yale University

D. C. Lu, Spokesman

P. O. Egan, V. W. Hughes, P. A. Souder

Columbia University

L. Delker, G. Dugan, C. S. Wu

We propose to study the feasibility and merits of using the 135° neutron beam pipe at the LAMPF beam stop for high-precision pionic and muonic x-ray experiments using crystal diffraction spectrometers. Our study will be addressed to: 1) can counting rates of ~1000/min for π x rays be achieved with a bent crystal? 2) can double flat-crystal spectrometers be used? and 3) can bent crystal spectrometers be used for μ x rays?

A summary is given of our prospective subsequent research interests in 1) intrinsic properties of the pion, 2) pion-nuclear strong interaction, 3) muonic QED, and 4) electron screening effects in pionic and muonic atoms.

A PRODUCT RECOIL STUDY OF THE $(\pi^\pm, \pi^\pm N)$ REACTION

Carnegie-Mellon University

A. A. Caretto, Spokesman

Purdue University

N. T. Porile

Reed College

L. B. Church

Kyoto University, Japan

N. Imanishi

LASL

R. S. Rundberg, C. J. Orth, B. J. Dropesky

We propose to measure the thick-target recoil ranges and the angular distributions of residual nuclei from pion-induced nucleon removal reactions, $(\pi^\pm, \pi^\pm n)$. This study will be undertaken on targets of ^{12}C , ^{66}Cu , and ^{197}Au (^{198}Pt) for angular distributions). Thick-target ranges will be measured at six energies ranging from 100 to 370 MeV while angular distributions will be determined at 180 MeV. Both π^- and π^+ mesons will be employed. These targets were selected because similar data exist for the analogous (p, pn) reactions on these targets.

Data of this type are necessary in order to deduce the reaction mechanism for $(\pi^\pm, \pi^\pm n)$ reactions. It has been assumed that most pion-induced nucleon removal reactions proceed by a quasi-free pion-nucleon scattering. Considerable theoretical efforts have been expended to attempt to explain why the cross-section ratio of π^+ to π^- induced reactions disagrees with the predictions of the quasi-free mechanism. A study of the product nucleus recoil behavior will indicate if the proposed mechanism is the correct one or if more than one mechanism is involved. It is known that proton-induced nucleon removal reactions take place by a combination of direct quasi-free scattering and (p, p') inelastic scattering followed by neutron evaporation. The discrepancy of the π^+ to π^- induced cross sections with theory might be easily understood if other mechanisms are

involved. Even if this is not the case, comparison of the results with Monte Carlo cascade calculations may be useful in pinpointing the source of the discrepancy.

Beam requirements are maximum pion beam intensity from the P^3 channel at each energy on the three targets: ^{12}C , ^{65}Cu , and ^{197}Au (^{198}Pt).

Exp. 544

SEARCH FOR A FAST FISSION PROCESS

LASL

J. B. Wilhelmy, Spokesman

C. J. Orth, R. S. Rundberg

Philipps Universitat, Marburg, West Germany

R. Brandt

We propose to search for fast fission processes induced with stopped pion capture. The method of study will be to measure charged-particle spectra emitted from the reaction and determine if the fission process can compete with nonequilibrium high-energy charged-particle emission. A series of medium weight through fissile targets will be studied. The lighter targets will provide normalization for nonfissile isotopes and their observed charged particle spectra will be fitted using cascade and exciton model analysis. The standard interpretation of the fission process is that it occurs from a statistical equilibrium configuration and therefore the nonequilibrium portion of the charged particle spectrum should not be influenced if the target nucleus is fissile. Over 90% of the fissile isotopes will decay by fission following π^- capture. If this process occurs following the pre-equilibrium cascade, then no distortion will be seen in the high-energy part of the cascade. If deviations are observed, then timing information can be obtained from the cascade analysis to make a quantitative statement regarding the fission width. With this technique we will be able to sample times on the order of 10^{-21} sec.

The experiment will be carried out in the LEP channel and can utilize maximum beam intensity (i.e. $p \geq 500 \mu\text{A}$). Total running time requested is five shifts.

Exp. 545

FUSION MATERIALS NEUTRON IRRADIATIONS A PARASITE EXPERIMENT

LASL

Robert D. Brown, Spokesman

W. F. Sommer, G. F. Hurley

Joint Research Center, Ispra, Italy

R. Dierckx

Princeton University

K. Young

This proposal brings together several requests for neutron irradiations of various materials of interest for fusion reactors. All the irradiations can be performed in the new radiation effects strainer now in the design stage.

A collaboration between the Euratom Joint Research Center at Ispra, Italy (represented by Ron Dierckx), and LASL, will study neutron irradiation effects in niobium and iron. Ispra will examine the samples using small-angle scattering, while we will emphasize transmission electron microscopy. Comparison of the damage between samples irradiated here and those irradiated at

other neutron sources will provide some information on differences in the damage caused by differences in neutron energy spectrum.

Work by George Hurley, CMB-5, will seek to determine mechanical properties of mica insulation following neutron irradiation. This material is being considered as insulation in a fusion ignition test reactor being constructed by MIT. Irradiations will be performed at the Rotating Target Neutron Source II (RTNS-II) and at the LAMPF radiation effects facility to compare mechanical properties at the same fluence.

Neutron irradiations of epoxy-Fiberglas flexure samples will also be conducted for Karl Young of Princeton Plasma Physics Laboratory; his group is attempting to formulate an epoxy resin that will have adequate strength and toughness, as well as be resistant to radiation.

Exp. 546

INVESTIGATION OF THE SPIN FORM FACTOR OF TRITIUM AND HELIUM-THREE

University of California, Los Angeles

B. M. K. Nefkens and W. J. Briscoe, Spokesmen

D. H. Fitzgerald, P. F. Glodis, M. E. Sadler, B. H. Silverman

LASL

C. L. Morris, H. A. Thiessen, R. L. Boudrie

We propose to measure the differential cross sections for the elastic scattering of $\pi^\pm$ on ^3H and ^3He in the angular region between 50° - 120° for incident pion energies 140-230 MeV. A comparison of the ratios $d\sigma(\pi^+ ^3\text{H})/d\sigma(\pi^- ^3\text{H})$ with $d\sigma(\pi^- ^3\text{He})/d\sigma(\pi^+ ^3\text{He})$ in the angular region between 70° - 90° is a very sensitive measure of the relative spin form factors of ^3H and ^3He . It constitutes a novel test of charge symmetry at a sizable momentum transfer where possible effects due to the mass difference of the up and down quark can manifest themselves.

Outside the dip region the above ratios are sensitive to the matter form factor.

Recent advances in pion-nucleus interaction calculations hold out the hope that it may ultimately be possible to extract the ^3H and ^3He hadronic form factors from the above experiments and compare them with ^4He electromagnetic form factors.

The single-arm spectrometer technique is adequate to separate the desired elastic scattering events from the background due to breakup and interactions in the target wall. In particular, the EPICS facility has ample resolution and acceptance for this purpose. We envisage the use of a stack of five gas targets filled with ^1H , ^3H , ^3He , and ^4He plus a dummy target.

Exp. 547

SEARCH FOR FAST MUONIUM IN VACUUM

Yale University

P. O. Egan and V. W. Hughes, Spokesmen

College of William and Mary

J. R. Kane, Spokesman

We propose to continue our search for muonium in vacuum with the view towards laying the groundwork for future experiments on muonium-antimuonium conversion and the muonium Lamb shift. We will look for energetic (several keV) muonium emerging from metal foils and gas charge-exchange cells in the muon beam. Such experiments are completely analogous to atomic physics beam-foil and charge-exchange cell techniques.

Two methods will be examined:

- A) Magnetic separation of the neutral fraction emerging from the targets and subsequent analysis of the decay products.
- B) Search for Lyman- α photons from $n = 2$ muonium with multistep avalanche chambers. Beam parameters required are 28 MeV/c μ^+ "surface" beam.

Exp. 548

AN INVESTIGATION OF THE ISOVECTOR CHARACTER OF THE 2_2^+ STATE IN ^{26}Mg BY π^+, π^- INELASTIC SCATTERING

Northwestern University

S. G. Iversen and K. K. Seth, Spokesmen

D. Barlow, M. O. Kaletka, D. Smith

It is proposed to measure inelastic scattering of 180 MeV π^+ and π^- from ^{26}Mg for the primary purpose of studying the 2_2^+ transition. Recent theoretical calculations predict that while the 2_1^+ state in ^{26}Mg is best described as two proton holes in ^{28}Si , an interesting inversion of the isovector character occurs for the 2_2^+ state. It appears more like two neutron particles plus a ^{24}Mg core. As a consequence the 2_2^+ state is expected to be more strongly excited by π^- , in contrast to the 2_1^+ state whose excitation by π^+ is slightly favored.

Exp. 549

A STUDY OF THE DCX REACTION MECHANISM — THE $^{42}\text{Ca}(\pi^+, \pi^-)^{42}\text{Ti}$ REACTION

Northwestern University

K. K. Seth, Spokesman

D. Barlow, S. G. Iversen, M. O. Kaletka, D. Smith

It is proposed to measure the excitation function for the ground state transition for the reaction $^{42}\text{Ca}(\pi^+, \pi^-)^{42}\text{Ti}$ in the energy range $T(\pi^+) = 140$ to 290 MeV and to also measure the ground state angular distribution at 290 MeV. It is expected that these measurements will have important bearing on the recently discovered empirical trends which indicate that the analog transitions correspond to a quite different DCX reaction mechanism than the nonanalog transitions, especially at energies well above the (3,3) resonance.

Exp. 550

**EXCITED STATE SPECTRA OF THE EXOTIC NUCLEI ^{18}C
AND ^{26}Ne BY (π^-, π^+) DCX REACTIONS**

Northwestern University

K. K. Seth, Spokesman

D. Barlow, S. G. Iversen, M. O. Kaletka, D. Smith

It is proposed to investigate the excited state spectra, in particular the 2_1^+ states of the $T = 3$ exotic nuclei $^{18}\text{C}_{12}$ and $^{26}\text{Ne}_{18}$ by means of (π^-, π^+) reaction on ^{18}O and ^{26}Mg targets. Knowledge of the excitation energy of these states is expected to be of crucial importance in determining how deformed such extremely neutron rich nuclei are and to what extent interactions optimized for nuclei near the valley of stability are successful in predicting the excitation of such nuclei.

It is proposed to measure these reactions at $T(\pi) = 164$ MeV at EPICS at angles greater than 15° , so that only the normal EPICS configuration is needed.

Exp. 551

MASSES OF ^{40}Ti AND ^{68}Zn BY (π^-, π^+) REACTIONS

Northwestern University

K. K. Seth, Spokesman

D. Barlow, S. G. Iversen, M. O. Kaletka, D. Smith

It is proposed to measure the ground state masses of the proton rich exotic nuclei ^{40}Ti and ^{68}Ni , using the DCX reactions $^{40}\text{Ca}(\pi^+, \pi^-)^{40}\text{Ti}$ and $^{68}\text{Ni}(\pi^+, \pi^-)^{68}\text{Zn}$. The knowledge of these masses, not measurable by other techniques, is expected to improve our understanding of binding energy systematics of many nuclei surrounding these and to lead to stringent tests of nuclear model calculations.

Exp. 552

ULTRAHIGH PRECISION MEASUREMENTS ON MUONIUM

Yale University

V. W. Hughes and P. O. Egan, Spokesmen

We intend to continue our studies of the ground state muonium Zeeman structure to even higher precision. We are submitting this letter of intent outlining our future plans in this field and, coupled with this letter, would also like to request 50 h of pulsed beam at the SMC for beam studies to assist in designing this experiment.

Goal and Motivation

The goal of this experiment is the ultrahigh precision measurement of μ_μ/μ_p and of $\Delta\nu$, the muonium hfs interval, to precisions of 10^{-7} and 10^{-8} respectively, with principal emphasis on improving μ_μ/μ_p . This would represent an improvement by a factor of three compared to presently available values. The motivations are the following:

1. Highest precision determination of μ_μ/μ_p and of m_μ/m_e . These fundamental constants of the muon are useful to g-2, precision muonic-atom x rays, and μSR .

2. Test of QED theory of μ^+e^- hfs, one of the most sensitive tests of QED. Apart from the knowledge of fundamental constants, the theory of $\Delta\nu$ is now accurate to about 0.5 ppm and is expected to be improved to 0.1 ppm. Effects due to the electroweak interaction are predicted to occur at levels of about 3×10^{-8} due to axial vector-axial vector coupling. A less conventional weak interaction coupling of muonium (M) to antimuonium ($\bar{M}$) would be observed at the level of $G_F/10$ coupling constants.

Exp. 553

**STUDY OF TARGET THICKNESS EFFECTS IN THE CROSS-SECTION
MEASUREMENT OF THE PION SINGLE-CHARGE-EXCHANGE REACTION
 $^{13}\text{C}(\pi^+, \pi^0)^{13}\text{N}$ (g.s.) FROM 50 to 350 MeV**

LASL

R. S. Rundberg, Spokesman

D. J. Vieira, G. W. Butler, G. C. Giesler, B. J. Dropesky

Kyoto University, Japan

N. Imanishi

The total cross section for the pion single-charge-exchange reaction $^{13}\text{C}(\pi^+, \pi^0)^{13}\text{N}$ (g.s.) has generated a great deal of theoretical interest. Conventional DWIA has been unsuccessful at reproducing the experimental data in the region of the (3,3) resonance. In addition, measurements using the π^0 spectrometer appear to disagree with the measurements using activation techniques. The previous activation measurement used a thick target (720 mg/cm²) which necessitated corrections for secondary reactions. The corrections in the experiment were calculated theoretically. We proposed to measure the total cross section for the $^{13}\text{C}(\pi^+, \pi^0)^{13}\text{N}$ (g.s.) with target thickness ranging from 20 mg/cm² to 200 mg/cm² to empirically determine the effect of secondary reactions. Isotopically enriched ^{13}C targets will be irradiated in the pion beams at LEP and P³. Targets of varying thickness will be irradiated with the maximum pion intensities available. The cross section extrapolated to zero thickness will be determined at eight pion energies from 50 to 350 MeV.

Exp. 554

**IRRADIATION OF TECHNOLOGICALLY IMPORTANT METALS
WITH 800-MeV PROTONS USING THE ISOTOPE PRODUCTION
FACILITY AT LAMPF**

LASL

R. D. Brown and J. R. Cost, Spokesmen

General Purpose

To investigate the response to high-energy proton irradiation of metals which are important to proton beam technology.

Proton Beam Technologies

- (1) accelerator windows
- (2) targets and claddings for spallation neutron sources
- (3) electronuclear fuel production components

Properties to be Studied

- (1) Mechanical properties (tensile strength and hardness)
- (2) dimensional changes.
- (3) production rate of helium and other spallation impurities.
- (4) electron microscopy

Metals to be Studied

- (1) Tungsten, tantalum, molybdenum, and depleted uranium will be studied for possible use as targets or claddings for spallation neutron sources.
- (2) Stainless steel and nickel-base alloys will be studied as materials for proton accelerator windows.
- (3) Copper and aluminum (in addition to some of the above materials) will be analyzed for helium and other impurities as a test of theoretical predictions of the rates of production of spallation impurities.

Irradiation Procedure

- (1) Irradiate an initial set of samples for one week at the Isotope Production Facility giving fluences of roughly $4 \times 10^{19} \text{ P}^+/\text{cm}^2$ or roughly 0.5 displacements per atom, depending upon the metal.
- (2) Follow up with other irradiations (roughly one per LAMPF cycle) varying in length from several hours to greater than one week, depending upon availability.
- (3) Beam parameters
FWHM = 5.0 cm
Flux (time averaged) = $7 \times 10^{13} \text{ p}^+/\text{cm}^2 \cdot \text{s}$.
- (4) Cool samples directly with water (except for copper and uranium).

Post-Irradiation Procedure

- (1) Remove from isotope production stringer using CNC remote handling equipment.
- (2) Transport to CMB-14 in CMR building for a cool-down storage period, typically greater than one month, depending upon metal.
- (3) Make appropriate measurements of properties in hot cell of CMB-14 using remote handling equipment.

Exp. 555

TOTAL CROSS-SECTION MEASUREMENTS OF THE SINGLE-CHARGE-EXCHANGE REACTION $^{12}\text{C}(\pi^+, \pi^0)^{12}\text{N} \text{ (g.s.)}$

LASL

D. J. Vieira, Spokesman

R. S. Rundberg, G. W. Butler, B. J. Dropesky

Kyoto University, Japan

N. Imanishi, Spokesman

We propose to measure the total single-charge-exchange cross section for the reaction $^{12}\text{C}(\pi^+, \pi^0)^{12}\text{N} \text{ (g.s.)}$ at pion energies ranging from 100 to 300 MeV. Activation techniques will be utilized to measure the yield of ^{12}N via its characteristic high β -decay energy ($Q_{\beta^+} = 16.3 \text{ MeV}$) and short half-life ($T_{1/2} = 11 \text{ ms}$). Since the ground state is the only particle bound state of ^{12}N ,

these measurements represent total cross-section determinations to an isolated final state enabling straightforward comparison of these data to theory. Such comparison should elicit a better understanding of the isovector component of single-charge-exchange reactions. Furthermore, comparisons of these measurements to integrated angular distributions of ^{12}C inelastic pion scattering leading to the analog state of ^{12}N (g.s.), which resides at 15.11 MeV in ^{12}C , provide an important test of isospin symmetry.

Exp. 556

**A PROPOSAL TO STUDY THE (p,p') PROCESS LEADING
TO π -ATOMIC STATES**

Massachusetts Institute of Technology

W. Bertozzi, Spokesman

M. Hynes, J. Kelly, S. Kowalski, W. Pugh, R. P. Redwine, W. Sapp, C. P. Sargent, and
W. Turchinets

LASL

G. W. Hoffmann

We propose to investigate the inelastic scattering of a proton from a nucleus wherein a pion in a bound mesonic orbit is created.

Exp. 557

**EXPOSURE, IN A PARASITIC MODE, OF A $3\text{ cm} \times 3\text{ cm} \times 1\text{ cm}$ STACK
OF SOLID TRACK DETECTORS TO A π^- BEAM**

Washington University

Ramanath Cowsik, Spokesman

No summary available.

Exp. 558

MEASUREMENT OF (π^+ , π^-) REACTIONS ON $^{13,14}\text{C}$ AND ^{26}Mg

Case Western Reserve University

H. W. Baer, Spokesman

LASL

J. D. Bowman, C. L. Morris, H. A. Thiessen

New Mexico State University

G. R. Burleson, Spokesman

S. J. Greene, B. Cottingame

University of Texas, Austin

W. J. Braithwaite, C. Harvey, C. F. Moore

University of Indiana

C. D. Goodman

University of Minnesota

D. B. Holtkamp

We propose to measure (π^+, π^-) DIAS angular distributions at $T_\pi = 164$ and $T_\pi = 292$ MeV on ^{14}C and at $T_\pi = 164$ MeV on ^{26}Mg . The ^{14}C data constitutes a part of the complete set of measurements of π^+ and π^- elastic, (π^+, π^0) IAS charge exchange, and (π^+, π^-) DIAS scattering on a single nucleus. The ^{26}Mg data will complete the systematics of (π^+, π^-) DIAS transitions on ^{14}C , ^{18}O , and ^{26}Mg at 164 and 292 MeV. We also propose to measure the non-DIAS $^{13}\text{C}(\pi^+, \pi^-)^{13}\text{O}$ angular distribution at $T_\pi = 292$ MeV. This will provide first data at the higher energy for an odd A nucleus, and it will constitute an important part of the isotope chain systematics $^{12,13,14}\text{C}(\pi^+, \pi^-)$. We also propose to measure the 5° excitation functions of $^{13,14}\text{C}$ at five additional energies between 100 and 300 MeV.

Parameters:

EPICS spectrometer with sweeping magnet installed.

$T_\pi = 164$ and 292 MeV for angular distribution.

$T_\pi = 100$ to 300 MeV for 5° excitation function.

500 h of π^- beam.

Exp. 559

SEARCH FOR NEUTRINO OSCILLATIONS

LASL

Minh Duong-Van, Spokesman

J. C. Allred, R. L. Burman, D.R.F. Cochran

Rice University

G. C. Phillips, Spokesman

J. B. Roberts, H. E. Miettinen, G. S. Mutcher

University of Houston

B. W. Mayes, L. S. Pinsky, A. D. Hancock

We propose an experiment at LAMPF to measure neutrino oscillations: $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$ using optical detectors. The proposed sensitivity in cm^2 is $0.10 (\text{eV})^2$. The detector, when filled with liquid scintillator, can study $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$ oscillations by detection of e^+ -delayed neutron coincidences. If successful, this technique could significantly increase signal to background ratio and provide increased sensitivity to cm^2 . The system would be useful to do subsequent neutrino experiments, either at LAMPF or at PSR and with π -horns. The principal request of LAMPF is for construction of a tunnel with the approximate dimensions: diameter 5 m, length 150 m, and a depth of 35 m.

**STUDY OF NEUTRON-IRRADIATION-INDUCED GROWTH OF METALS
AT RADIATION EFFECTS FACILITY**

LASL

A. Harvey, Spokesman

AECAN

S. MacEwan

Metal growth as a result of fast neutron irradiation will be studied in the A-6 Radiation Effects Facility as a function of:

1. grain size,
2. dislocation density (cold work), and
3. solute additions.

The experiment will use a well-developed rig which includes a gas gauge for dimensional readout during steady-state irradiation, and an electrical heater for specimen temperature control (100-300°C).

LAMPF's Radiation Effects Facility offers, for such studies, the advantages of ease of access, and low thermal neutron and gamma fluxes.

Exp. 561

$\pi^\pm$ — NUCLEAR ELASTIC SCATTERING AT ENERGIES BETWEEN 30 AND 80 MeV

Virginia Polytechnic Institute and State University

M. Blecher, Spokesman

K. Gotow, R. Ng

Oak Ridge National Laboratory

F. Obenshain, Spokesman

F. E. Bertrand, E. E. Gross

LASL

M. Hynes, Spokesman

R. L. Burman, R. Carlini, M. J. Leitch, V. D. Sandberg

University of South Carolina

G. S. Blanpied, R. D. Edge, B. M. Preedom, B. G. Ritchie

Massachusetts Institute of Technology

W. Bertozzi

University of Maryland

N. S. Chant, P. G. Roos

We request beam time for the study of $\pi^\pm$ elastic nuclear scattering in the energy range of 30-80 MeV, for angles from 25-125°. We will use the Bicentennial Magnetic Spectrometer fitted with the VPI and State University vertical drift chamber to identify elastically scattered pions (as done in Experiment 333). Our emphasis in this experiment is to concentrate on the isotopes of nuclei rather than the core nuclei studied in Experiments 29/54 and 333. We propose to measure elastic differential cross sections from ^{13}C , ^{14}C , ^{40}Ca , ^{58}Ni , ^{60}Ni , ^{64}Ni , ^{116}Sn , ^{118}Sn , ^{120}Sn , ^{122}Sn , ^{124}Sn , and ^{142}Nd for the conditions indicated in Table I.

STUDY OF THE PION ABSORPTION MECHANISM THROUGH THE $A(\pi, p)X$ REACTION AT $T_\pi = 500$ MeV

Argonne National Laboratory

H. E. Jackson and J. P. Schiffer, Spokesmen

R. J. Holt, R. D. McKeown, K. E. Stephenson, J. R. Specht

Northwestern University

R. E. Segel

A measurement of inclusive proton spectra is planned with 500-MeV π^+ on targets of ^4He , ^{12}C , Ni, and ^{181}Ta as a function of angle. Studies carried out at lower energies (Experiments 293 and 350), indicate that pion absorption in the Δ resonance region involves a relatively large number of nucleons. Comparison of inclusive spectra generated by pions in and above the Δ resonance region is expected to clarify which features of the proton spectra originate from the pion absorption vertex and which from rescattering of the emerging protons. Observation of the strength of the peak in the proton spectrum generated by the $\pi + 2N \rightarrow 2N$ reaction will illuminate the character of the pion absorption mechanism in nuclei. The measurement would be carried out at the High Energy Pion Channel using the Argonne Large Acceptance Spectrometer (ALAS). A beam of 10^7 π^+ /s with a momentum spread of $\pm 1\%$ will be used.

$p + p$ ELASTIC SCATTERING AT 800 AND 500 MeV

University of Texas, Austin

G. W. Hoffmann, Spokesman

M. Barlett, R. Ferguson, J. McGill, C. Milner, C. Sorenson

LASL

J. F. Amann

University of South Carolina

G. S. Blanpied

Using the HRS and a CH_2 target, we will measure the $1\text{H}(p, p)$ elastic angular distribution over the center-of-mass angular range $8-90^\circ$ for incident proton energies of 800 and 500 MeV. A careful mapping of the HRS focal plane will be done in conjunction with the experiment in order to assure uniformity for the extracted relative angular distributions. The absolute normalization will be accomplished through careful calibration of HRS solid angle and through use of the new HRS Faraday cup or an ion chamber cross calibrated to the EPB Faraday cup. Overall absolute normalization should be determined to better than 5%.

The experiment is motivated because of gross disagreement between published 800-MeV $p + p$ elastic angular distribution data and recent phase shift predictions of Arndt and because of disagreement between the published data and other data obtained recently at HRS.

Seventy-five hours are requested at each energy.

Exp. 564**STUDY OF SMALL ANGLE ${}^4\text{He}(\pi^-, \pi^+)$ REACTION*****Argonne National Laboratory****R. D. McKeown, Spokesman**D. F. Geesaman, R. J. Holt, H. E. Jackson, J. P. Schiffer, J. R. Specht, K. E. Stephenson, B. Zeidman*

A search for structure in the ${}^4\text{n}$ system is proposed via the ${}^4\text{He}(\pi^-, \pi^+)$ reaction in the energy range $150 \leq T_\pi \leq 300$ MeV. The ALAS will be used to analyze the emerging π^+ (<4 -MeV energy resolution) as a function of scattering angle ($0^\circ \leq \theta \leq 30^\circ$) with emphasis on zero degree scattering where the cross section to 0^+ states should be largest. Using the π^- flux available at the P³ channel, a sensitivity of <20 nb/sr should be easily attainable.

Exp. 565**EXCITATION OF HIGH-SPIN PARTICLE-HOLE STATES IN** **${}^{54}\text{Fe}$ AND ${}^{58}\text{Ni}$** ***Argonne National Laboratory****B. Zeidman, D. F. Geesaman, Spokesmen**R. D. Lawson****Indiana University****C. Olmer****LASL****R. L. Boudrie, C. L. Morris, H. A. Thiessen****University of Massachusetts****R. A. Lindgren****New Mexico State University****G. R. Burleson, S. J. Green, W. B. Cottingham****Northwestern University****R. E. Segel****Oregon State University****L. W. Swenson*

Inelastic scattering of ~ 170 -MeV π^+ and π^- by ${}^{54}\text{Fe}$ and ${}^{58}\text{Ni}$ is proposed. The EPICS system will be used to investigate high-spin particle-hole states in these nuclei. Previous electron scattering data indicate strong 8^- states from $(f_{7/2}^{-3} \times g_{9/2})$ configurations are preferentially excited at high momentum transfer. Shell model calculations suggest that π^+ and π^- scattering are particularly well suited to the study of these stretched configurations. Different states are expected to be excited with pions as opposed to proton or electron scattering.

Exp. 566**INELASTIC p-p AND p-d CROSS SECTIONS AT 800 MeV****A SEARCH FOR NARROW EXCITED STATES*****Northeastern University****D. A. Garelick and R. B. Hurst, Spokesmen**B. Brown*

Texas A&M University

W. D. Cornelius, G. C. Glass

Massachusetts Institute of Technology

B. Craft

We propose an accurate measurement of the 30° p-p and p-d inelastic cross sections from the elastic peak to the highest accessible excitation energies at which the recoil protons can be detected. While careful measurements of the elastic peak have been made (e.g., Willard et al.), it appears that no thorough studies of the inelastic spectra have been conducted with the high resolution and high statistics which are available at LAMPF. These data will add to the general knowledge of nucleon-nucleon interactions, and more specifically, we hope by conducting such a careful measurement to set an upper limit on the existence of possible narrow excited states of nucleons predicted by some theoretical models. The proposed experiment would be conducted at HRS using an existing liquid H₂ target.

Exp. 567

A STUDY OF THE $\pi^- + d \rightarrow p + p$ REACTION AT PION ENERGIES 500-200 MeV

University of South Carolina

B. G. Ritchie, Spokesman

G. S. Blanpied, R. D. Edge, B. M. Freedom

Virginia Polytechnic Institute and State University

K. Gotow, Spokesman

M. Blecher and R. Ng

University of Virginia

R. C. Minehart, Spokesman

J. Boswell and J. F. Davis

University of Maryland

N. S. Chant and P. G. Roos

LASL

R. L. Burman, M. J. Leitch, M. Hynes

Oak Ridge National Laboratory

F. E. Bertrand, E. E. Gross, F. Obenshain

Massachusetts Institute of Technology

R. P. Redwine

The study of the reaction $\pi^- + d \rightarrow p + p$ at 5, 10, 15, 20, 60, 65, 75, 85, 95, 105, 115, 125, 135, 145, 160, 180, and 200 MeV is proposed. Angular distributions of the protons produced in the reaction will be measured with an array of scintillator telescopes.

The results of the study will produce a comprehensive set of high accuracy data for the reaction which will resolve the discrepancies that exist between experiments performed prior to this attempt. The data will permit more sensitive tests of the theoretical models of pionic absorption in the region of the $\pi N(3,3)$ resonance. The data will also provide a definitive measurement of the energy dependence of the total absorption cross section at energies below the $\pi N(3,3)$ resonance.

**MEASUREMENTS OF THE MASSES OF $T_z = -2$ NUCLEI AND OF THE
SYSTEMATICS
OF (π^+, π^-) CROSS SECTIONS ON $N = Z$ NUCLEI**

LASL

C. L. Morris, Spokesman

New Mexico State University

G. R. Burleson

S. J. Green, W. B. Cottingham

University of Texas, Austin

W. J. Braithwaite, C. F. Moore

Michigan State University

J. Nolen, L. Harwood

University of Minnesota

D. B. Holtkamp, A. Zeller

Argonne National Laboratory

B. Zeidman

We propose to measure cross sections for and masses of the final-state nuclei produced in the (π^+, π^-) pion double-charge-exchange (DCX) reaction on ^{14}N , ^{28}Si , and ^{40}Ca at an incident pion energy of 180 MeV and an angle of 5° (lab). Since DCX cross sections on $N = Z$ even-even nuclei measured previously show a simple unexpected A dependence, we want to extend measurements on nuclei of this type to determine whether this simplicity is a general feature of these cross sections, and also to determine one cross section for an odd-odd $N = Z$ nucleus. These measurements would also yield new mass measurements on proton-rich $T_z = -2$ nuclei, which would allow further tests of the isobaric multiplet mass equation for isospin quintets.

Parameters: EPICS spectrometer with sweeping magnet installed. $T = 180$ MeV. Beam time requested = 360 hours.

Exp. 569 **π^+/π^- INELASTIC SCATTERING FROM ^{19}F** *University of Minnesota*

D. Dehnhard and D. B. Holtkamp, Spokesmen

M. A. Franey, S. J. Tripp

LASL

R. L. Boudrie, C. L. Morris

Pion-nucleon scattering at energies near the $(3,3)$ resonance exhibits the well-known selectivity of π^+ over π^- (π^- over π^+) scattering from protons (neutrons) with a cross-section ratio of 9:1. The recent results for pion inelastic excitation of states in ^{13}C indicate that this selectivity is retained for simple particle-hole transitions induced by pion scattering from complex nuclei at resonance energies.

We propose to measure inelastic scattering from ^{19}F of both π^+ and π^- at EPICS. We will concentrate our study on the low-lying states of ^{19}F , especially the transition to the $5/2^-$ state at 1.35 MeV. Transition strengths for this state obtained by electromagnetic probes are typically three to four times larger than those obtained with hadronic probes. Thus, the neutron and proton components of this transition may be very different, and a π^+/π^- comparison appears to provide the best

method for studying such differences. Another aspect of the present proposal is a test of recent shell model predictions of neutron and proton components of E4 transitions.

Beam Requirements: ≥ 0.3 mA incident proton beam at A1 target.

Channel Requirements: EPICS at standard configuration (162 MeV $\pi^\pm$).

Target: ^{19}F [teflon - $(\text{CF}_2)_n$].

INVESTIGATION OF THE STRUCTURE OF ^{16}O WITH PION INELASTIC SCATTERING

University of Minnesota

D. B. Holtkamp, Spokesman

D. Dehnhard, M. A. Franey, S. J. Tripp

University of Pennsylvania

H. T. Fortune, Spokesman

LASL

C. L. Morris

Within the framework of the distorted wave impulse approximation (DWIA), a comparison of π^+ inelastic scattering with π^- inelastic scattering, furnishes the information necessary to investigate not only the proton/neutron composition of transitions but also to test rigorously the wave functions for those states that the reaction mechanism is now fairly well understood.

With these two intentions in mind, we propose to measure π^+ inelastic scattering from two sets of states in ^{16}O : (1) the low-lying positive parity states, resulting from α -cluster configurations (plus 2p-2h), and (2) the negative parity p-h excitations into the sd shell. Comparisons of the form factor for excitation of the two 2^- (6.92 and 9.85 MeV) and 4^- states (10.35 and 11.10 MeV), which exhibit puzzling anomalies in experiments with other nuclear probes, should be instructive as to the microscopic nature of these states. Comparisons of π^+/π^- scattering to the 1^- , 2^- , 3^- , and 4^- states will provide more cases of isospin mixing and more information about several good shell model states. In particular, there is inconclusive evidence that the isospin mixing in the 1^- (7.12 MeV) state results from a nuclear charge dependence which has the opposite sign to that of the Coulomb interaction (as observed in previous experiments), so it is possible that the study of this state with π^+/π^- comparisons may yield evidence of charge dependence in the nuclear force other than Coulomb.

Because of the necessity to obtain comparable π^- angular distributions as well as π^- cross sections for these states, a total of 225 hours of EPICS beam time is requested.

MUON SPIN ROTATION STUDIES OF DILUTE MAGNETIC ALLOYS

Rice University

S. A. Dodds, Spokesman

LASL

R. H. Heffner, M. E. Schillaci, Spokesmen

R. L. Hutson, M. Leon, C. E. Olsen

University of California, Riverside

D. E. MacLaughlin

Sandia Corporation

P. M. Richards

A knowledge of muon motion in a variety of host materials is essential to the wide usefulness of μSR techniques. By adding a low concentration of paramagnetic impurities to a host metal, we greatly extend the range of hosts and temperatures where it is possible to determine muon diffusion coefficients. In addition, we gain information about the impurity spin dynamics which is not

accessible to conventional techniques, and we determine the nature of the muon-impurity interaction.

The specific systems chosen are gold and silver hosts with 100-300 ppma (parts per million atomic) of erbium or gadolinium impurities, and copper with manganese impurity. These materials were chosen because their low temperature properties are well characterized; they offer a suitable range of properties to test our models and μ SR data is available for some of them from Exp. 375.

Parameters: The experiment requires positive muons, and is best carried out at SMC. There are no special beam requirements.

Exp. 572

A-DEPENDENCE OF THE (π^+, π^-) REACTION AND THE WIDTH OF A DOUBLE ISOBARIC ANALOG STATE IN HEAVY NUCLEI

New Mexico State University

S. J. Greene, Spokesman

G. R. Burleson, W. B. Cottingham

University of Texas, Austin

C. F. Moore, Spokesman

W. J. Braithwaite

LASL

C. L. Morris

Argonne National Laboratory

B. Zeidman

University of Minnesota

D. B. Holtkamp

We propose to make measurements of $d\sigma/d\Omega$ (5°) at 292 MeV for transitions to double isobaric analog states in heavy nuclei, and to determine the width of such a state in ^{208}Pb . The targets we wish to use are ^{90}Zr , ^{120}Sn , and ^{208}Pb . This is an extension of work begun in Experiments 310/448, which continues our effort to examine the systematics of pion double-charge-exchange reactions and learn about aspects of nuclear structure.

This proposal continues the collaboration of Experiments 310/448 and uses the EPICS small angle DCX system we developed for those experiments.

Exp. 573

PION SCATTERING FROM ^{24}Mg AND ^{26}Mg

University of South Carolina

G. S. Blanpied, Spokesman

B. M. Freedom, B. G. Ritchie

LASL

H. A. Thiessen, C. L. Morris

University of Texas, Austin

C. F. Moorie, C. Harvey

Institut für Experimentelle Kernphysik, Karlsruhe

J. E. Bolger

Michigan State University

B. H. Wildenthal

The experiment consists of using EPICS to measure the elastic and inelastic angular distributions for 180 MeV π^+ and π^- scattered from $^{24,26}\text{Mg}$. We plan to use the selectivity of pion scattering to the proton and neutron components of the ground state and of the excited states that are populated by $\ell = 2, 3$, and 4 transitions from the ground state. We are requesting 279 hours for this experiment.

Exp. 574

POLARIZED PROTON SCATTERING FROM ^{40}Ar

University of South Carolina

G. S. Blanpied, Spokesman

B. M. Preedom, B. G. Ritchie

University of Texas, Austin

G. W. Hoffmann, M. Barlett, J. McGill

We plan to measure the elastic and inelastic scattering of 0.8-GeV polarized protons from ^{40}Ar . The ^{40}Ar elastic data, along with that for ^{40}Ca , will be used to deduce the differences in the rms neutron densities of these nuclei. The inelastic data will provide information on the low-lying states which seem to be explained by a vibrational collective model. This is in contrast to the states in ^{40}Ca . We will look for the $\{(d\ 3/2)^- \times (f\ 7/2)\} = 5^-$ state which has not been identified in ^{40}Ar . This state is known to be located at an energy of 4.49 MeV in ^{40}Ca . We are requesting 100 hours for this experiment.

Exp. 575

POLARIZED PROTON SCATTERING FROM $N = 28$ NUCLEI

University of South Carolina

G. S. Blanpied, Spokesman

B. M. Preedom, B. G. Ritchie

University of Texas, Austin

G. W. Hoffmann, Spokesman

M. Barlett, J. McGill

University of Colorado

R. J. Peterson

We plan to use the HRS to measure the elastic and inelastic scattering of 0.8-GeV polarized protons from the $N = 28$ nuclei, ^{50}Ti , ^{51}V , and ^{52}Cr . The angular distributions and analyzing powers for the low-lying states that have relatively simple wave functions will be analyzed in terms of a microscopic model. In the simplest configuration these nuclei consist of from two to four $f\ 7/2$ protons outside a ^{48}Ca core. These pure configurations can only be responsible for positive parity states up to spins of 6 (8) in the case of ^{50}Ti (^{52}Cr). The observed higher spin states are expected to result from core excitations. With 800-MeV protons, we should observe some of these high-spin states as well as the lower spin states that have been observed in low-energy (p,p') experiments. We are requesting 158 hours of 0.8-GeV polarized protons for our measurements.

Exp. 576

**STUDY OF THE $(\pi^-, 2p)$ AND (π^-, pn) REACTIONS ON THE
ISOTOPIC PAIRS ^{16}O - ^{18}O AND ^{40}Ca - ^{48}Ca**

University of Maryland

F. G. Roos, N. S. Chant, Spokesmen

University of South Carolina

B. M. Freedom, Spokesman

G. S. Blanpied, B. G. Ritchie

Massachusetts Institute of Technology

M. Hynes, R. P. Redwine

Virginia Polytechnic Institute and State University

M. Blecher, K. Gotow

LASL

R. L. Burman, M. J. Leitch

Energy-sharing data for the $(\pi^-, 2p)$ reaction on ^{16}O and ^{40}Ca will be obtained at 50, 100, and 180 MeV, with a binding energy resolution of approximately 1 MeV at 50 MeV, increasing to 1.5 MeV at 180 MeV. The energy dependence of the reaction-plus measurements at each energy of four angle pairs, for which zero recoil momentum is kinematically allowed, will provide a test of the factorization of the two-body $\pi^- + (pn) \rightarrow p + p$ t-matrix at each energy. Preliminary DWIA calculations based on a quasi-deuteron model indicate little energy dependence in the reaction. Assuming that this result is borne out by the ^{16}O and ^{40}Ca data, measurements of the $(\pi^-, 2p)$ reaction on ^{18}O and ^{48}Ca will be carried out for two angle pairs at a single energy in order to examine transitions involving nucleons from different shells. During this second phase additional time has been requested to examine the feasibility of the (π^-, pn) reaction. Neutron singles rates will be measured, and a (π^-, pn) measurement attempted. Based on the results of these tests, an additional proposal will be submitted to carry out studies of the (π^-, pn) reaction on these same targets.

Exp. 577

MEASUREMENT OF ANGULAR DISTRIBUTIONS FOR $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}$

New Mexico State University

S. J. Greene, Spokesman

G. R. Burleson, W. B. Cottingham

University of Pennsylvania

H. T. Fortune, Spokesman

University of Texas, Austin

C. F. Moore

LASL

C. L. Morris

University of Minnesota

D. B. Holtkamp

We propose to measure angular distributions of $d\sigma/d\Omega$ at 164 MeV for the reaction $^{16}\text{O}(\pi^+, \pi^-)^{16}\text{Ne}$ over an angular range of ~ 0 to 50° . We will attempt to observe the lowest lying 0^+ , 2^+ , and 4^+ states in ^{16}Ne . Using the results of previous theoretical studies of the structure of ^{16}C , we hope to understand the nature of the transition as a mixture of various two-step processes.

The experiment will make use of the small angle DCX setup from Experiment 310/448 for angles $<35^\circ$ and the EPICS vacuum-coupled chamber for angles $\geq 35^\circ$.

Parameters: $T = 164$ MeV. Running time = 462 hours.

Exp. 578

PION INELASTIC SCATTERING FROM ^{20}Ne

LASL

C. L. Morris, Spokesman

University of Pennsylvania

H. T. Fortune, Spokesman

University of Minnesota

D. Dehnhard, D. B. Holtkamp, S. J. Tripp

University of South Carolina

G. S. Blanpied

We propose to measure inelastic π^- and π^+ scattering on ^{20}Ne at one incident energy of 164 MeV, using a cooled gas target containing enriched ^{20}Ne gas. The experiment will test the Brown-Fortune conjecture and should provide valuable information about the nature of the (π, π') reaction mechanism, in a nucleus whose structure is reliably known.

Exp. 579

**A RADIOCHEMICAL STUDY OF NEUTRON-DEFICIENT PRODUCTS
FROM 500 MeV OF ^{238}U**

LASL

W. Faubel, Spokesman

B. P. Bayhurst, B. J. Dropesky, C. J. Orth, R. J. Prestwood

We propose to do a radiochemical study of the neutron-deficient isotopes produced from the reaction of 500-MeV protons on ^{238}U . The objective will be to determine the cross sections of the neutron-deficient isotopes, particularly in the light-mass and symmetry region where few measurements have been made. These data are necessary in order to help understand the results of Exp. 416 (fast pion induced fission of ^{238}U), in which we could find neutron-deficient isotopes only in the heavy- and the light-mass region, but not in the symmetry region.

Thin foils of depleted uranium will be bombarded with protons of 500-MeV for 1-10 min using the Nuclear Chemistry Rabbit System. The irradiated targets will be processed radiochemically for selected elements, and the cross sections of the radioisotopes will be determined by high resolution Ge(Li) γ -ray spectrometry.

Exp. 580

**CROSS SECTIONS AND ANALYZING POWERS FOR ELASTIC AND INELASTIC
SCATTERING OF 515-MeV PROTONS FROM ^{13}C**

University of Minnesota

S. J. Tripp, D. Dehnhard, Spokesmen

M. A. Franey

LASL

J. F. Amann, R. L. Boudrie

There have recently been a number of studies of the nucleus ^{13}C . The most useful of these in terms of nuclear structure information have been the (π, π') and (e, e') measurements. It is desirable to have high quality (p, p') data for comparison with the (π, π') and (e, e') data. For this reason, we propose to measure cross sections and analyzing powers for elastic and inelastic scattering of 515-MeV polarized protons from ^{13}C for excitation energies up to 23 MeV. Transitions to low-lying "single-particle" states, $1/2^-$ (3.09) and $5/2^-$ (3.85), and to "spin-flip" states $(7/2^-, 9/2^-)$ at 9.5, 16.05, 17.92, 21.37, and 21.60 MeV are of primary interest. We have chosen 515 MeV because at this energy the nucleon-nucleon interaction is well known and this energy is still high enough so that the impulse approximation is valid. In addition, the spin dependent terms in the interaction are relatively stronger at ~ 500 MeV than at ~ 800 MeV, which will be an important aid in seeing the high-lying "spin-flip" states.

Exp. 581

**π^- ELASTIC SCATTERING FROM DEUTERIUM
AT 237 MeV**

University of Colorado

T. G. Masterson, Spokesman

J. J. Kraushaar, D. A. Lind, R. J. Peterson, R. S. Raymond, R. A. Ristinen

LASL

R. L. Boudrie, Spokesman

California State University, Sacramento

E. F. Gibson

We propose an accurate comparative measurement of π^- and π^+ elastic scattering cross sections from deuterium at 237 MeV to augment our comparison at 143 MeV. Solid CD_2 targets will be used with the EPICS system. Each run will be normalized to the pion-proton data. We anticipate a test of charge symmetry to an accuracy of a few percent in the 180 h of running time to cover the angular range from 20 to 120 degrees (lab).

Exp. 582

QUADRUPOLE SCATTERING OF PIONS BY ^9Be

New Mexico State University

W. B. Cottingham and G. R. Burleson, Spokesmen

S. J. Greene

We propose to measure $^9\text{Be}(\pi^\pm, \pi^\pm)^9\text{Be}$ angular distributions at 188 MeV where our optical model calculations predict, in the absence of quadrupole contributions, a highly diffractive struc-

ture. The lack of diffractive structure for the 162-MeV ${}^9\text{Be}(\pi^+, \pi^+){}^9\text{Be}$ angular distributions have been interpreted as evidence for a quadrupole contribution to pion elastic scattering. Since our calculations are in reasonable agreement with the 162-MeV data, excluding any quadrupole contributions, angular distributions at 188 MeV are necessary to determine whether such contributions are indicated.

The EPICS facility is suited for our measurements and we are requesting 190 h of beam time.

Beam Requirements: >0.3-mA incident proton beam at A1 target.

Channel Requirements: EPICS at standard configuration (188-MeV π^+).

Target: Natural beryllium

Exp. 583

MEASUREMENT OF $C_{\ell\ell}$ IN THE COULOMB INTERFERENCE REGION

University of California, Los Angeles

G. Pauletta, Spokesman

B. Aas, G. J. Igo, J. B. McClelland, C. A. Whitten, Jr.

Argonne National Laboratory

H. Spinka, K. Imai

University of Minnesota

M. M. Gazzaly

LASL

J. J. Jarmer

We will measure $C_{\ell\ell}$ at angles ranging between 1.5 and 30° (lab) for one or more beam momenta ranging between 0.8 and 1.46 GeV/c. The measurement will be performed in Line C using the HRS spectrometer and the LAMPF longitudinally polarized target. Given the impossibility of detecting the low-energy recoil particle due to the large magnetic fields of the polarized target, it becomes necessary to use a spectrometer having good resolution. Good momentum resolution is essential to discriminate against protons scattering off the heavier target components (${}^{12}\text{C}$ and ${}^{16}\text{O}$) down to small angles, while the good beam handling conditions in Line C are necessary to ensure a stable, small-phase-space beam. This has been established in the course of Exp. 15 which measured the differential cross section and analyzing power for pp scattering at 800 MeV. We would like to stress that, given the relatively long set-up time (~1 week), it would be best to schedule the experiment for the beginning of a cycle and it would be advantageous to run it at more than one energy.

Exp. 584

GOOD-RESOLUTION STUDY OF ${}^{16}\text{O}(\pi, \pi')$

University of Minnesota

D. Dehnhard, Spokesman

S. J. Tripp, D. B. Holtkamp

University of Pennsylvania

H. T. Fortune, Spokesman

LASL

C. L. Morris, J. F. Amann

We propose to measure inelastic cross sections at ~ 160 MeV for π^+ inelastic scattering from ^{18}O with about 100-keV resolution, in order to resolve states not previously separable, and thereby to enable meaningful comparison between theory and experiment.

Exp. 585

MEASUREMENT OF $\bar{p}$ -p AND $\bar{p}$ -d ELASTIC SCATTERING IN THE COULOMB INTERFERENCE REGION BETWEEN 500 AND 800 MeV

University of California, Los Angeles

G. Pauletta, Spokesman

M. Bleszynski, G. J. Igo, B. Aas, C. A. Whitten, Jr., J. B. McClelland

University of Minnesota

M. Gazzaly

We propose to measure the differential elastic cross sections and asymmetries for p-p and p-d scattering at about 1.2 and 1.3 GeV/c. These measurements will constitute important constraints on phase shift analyses. Furthermore by parameterizing the scattering amplitude appropriately, we will be able to determine:

1. the ratio of the real to imaginary parts of the spin-independent p-n and p-d scattering amplitude at zero momentum transfer (q),
2. the real part of the spin-orbit amplitude (divided by the sine of the scattering angle) at $q = 0$,
3. the contribution of the double spin-flip amplitudes to the differential cross section at $q = 0$.

The first and second items of information are necessary for microscopic calculations of p-nucleus scattering. Comparisons of items one and three with the predictions of forward dispersion relation calculations is of particular significance in light of recent speculations concerning the existence of dibaryon resonance in this energy region.

Exp. 586

A STUDY OF THE EFFECTS OF VERY STRONG ELECTRIC FIELDS ON THE STRUCTURE OF THE H^- ION

University of New Mexico

H. C. Bryant, Spokesman

K. B. Butterfield, D. A. Clark, C. A. Frost

LASL

P. A. M. Gram, Spokesman

J. B. Donahue, M. E. Hamm, R. W. Hamm

University of Connecticut

W. W. Smith

In previous experiments that studied the broadening and quenching of resonances in the photodetachment of H^- , certain resonances turned out to be resistant to perturbing electric fields to a degree far beyond the expectations of theory as well as the capability of the experimental method then in use. The development, in a recently completed experiment (No. 449), of a method of detecting the residual H^0 formed in the reaction $\gamma + \text{H}^- \rightarrow e^- + \text{H}^0$ instead of the detached

electron, allows the use of considerably stronger fields. (Previously, strong fields so altered the electron trajectories that their detection became uncertain.) This proposal requests time to observe the effect of electric fields up to $6 \cdot 10^6$ V/cm, four to five times stronger than those possible before, upon these "durable" resonances. These measurements on the dynamics of a strongly perturbed simple atomic system will provide, as indeed they already have begun to, valuable input to calculations in atomic physics where the Hamiltonian is known exactly and the unmet challenge is to derive realistic numerical characterization of the wave functions.

Exp. 587

FUNDAMENTAL EXPERIMENTS WITH RELATIVISTIC HYDROGEN ATOMS: EXPLORATORY WORK

University of Connecticut

W. W. Smith, Spokesman

D. Hamilton

LASL

J. B. Donahue, Spokesman

P. A. M. Gram, M. E. Hammi, R. W. Hamm

University of New Mexico

H. C. Bryant, D. A. Clark, C. A. Frost, K. B. Butterfield

We propose to use the technique and apparatus developed for laser photodetachment of H (Experiments 339 and 449) for a feasibility study of some fundamental laser spectroscopy experiments with relativistic hydrogen atoms. The relativistic Doppler shift of the third or fourth harmonic of a pulsed YAG laser (fundamental at $1.06\text{-}\mu$ wavelength) provides what is, in effect, a continuously tunable vacuum-ultraviolet laser in the rest frame of the moving ion or atom. By changing the angle of intersection between the laser beam and the LAMPF 800-MeV H⁺ or H⁰ beam, it is possible to obtain barycentric photon energies up to $\sim 16\text{eV}$. Laboratory lasers with these characteristics do not exist at present. Furthermore, the high-velocity beam allows one to transform a modest laboratory-frame magnetic field into a strong barycentric electric field in the multimegavolt/cm range, which opens up a relatively unexplored regime for basic Stark-effect studies on a simple system. The unique experimental facility developed at LAMPF for H⁺ photodetachment studies can easily be adapted for several kinds of fundamental experiments with excited hydrogen atoms. A preliminary report on our very successful exploratory spectroscopic work with atomic hydrogen beams at LAMPF has been given. The new measurements, in rough priority order, that we wish to make and that are feasible with minimum modification of the present apparatus are as follows:

1. Absolute calibration of the LAMPF beam energy to $1:10^4$ or better, by using the known (1s-np) transition energies (Lyman series) in atomic hydrogen. This permits absolute calibration of the photon energy for exciting the narrow "Feshbach" resonance (nominally at 10.93-eV photon energy) and several higher photodetachment resonances previously observed in H⁺ (Experiment 339) to within ~ 0.001 eV. Discrepancies between various calculations of the eigenvalues of the Feshbach and higher resonances are now at the level of a few millielectron volts. The proposed beam energy measurement would verify or correct the energy scale we have been using in Experiments 339 and 449.
2. High resolution (10^{-3} eV) threshold photoionization measurements from the ground state of atomic hydrogen in a strong motional electric field in the multimegavolt/cm range. This would be a study of the Stark effect on the photoionization process: $\text{H}^0(1s) + h\nu \rightarrow \text{H}^+ + e^-$, in a higher field regime than ever before.

3. High-field studies of the Stark energy shifts and accompanying field-ionization phenomena in low-lying laser-excited states of atomic hydrogen. Initially, we propose to study these effects in motional electric fields up to 5 MV/cm using a 10-kG laboratory magnet inside the beam pipe. Selection of a single initial excited state and polarization-control of m_l substates would be important features of this work. (A concurrent proposal discusses the design of this magnet.)
4. A demonstration of the validity of the relativistic Doppler formula $h\nu_{\text{st}} = h\nu_{\text{lab}} \gamma(1 + \beta \cos \alpha)$ to significantly higher precision than ever before: 1:10⁴ or better, over a substantial range of angles α . Preliminary measurements already made during Experiment 449, using the Lyman series in H⁺ verify the formula at approximately the 1:2000 level of precision.

Other unique and fundamental experiments are under consideration for the future, subject to the successful demonstration of results from Items 1-4, above. These include quantitative multiphoton ionization measurements on the simplest atomic system, where accurate matrix elements are available to test theoretical models; "self-merged" beam collision experiments of H⁺ or H⁻ with excited atomic hydrogen in specific states; and a new version of the *first-order* ether-drift experiment performed with a microwave maser by C. Townes et al., in 1958 (Phys. Rev. Letters **1**, 342), making use of the Lyman series absorption in atomic hydrogen and a β of 0.84 in contrast to the original experiment, which used a β of $\sim 10^{-4}$. Atomic parity-violation experiments involving atomic hydrogen Lyman transitions and/or forbidden transitions in strong fields are worth a serious look for a future experiment.

Exclusive of tune-up and installation time, we expect the data runs on Doppler shift and absolute energy calibration to take one week. The exploratory photoionization and Stark studies should take an additional week.

Exp. 588

A SEARCH FOR LONG-LIVED STATES OF THE H⁺ ION

University of New Mexico

D. A. Clark and H. C. Bryant, Spokesmen

K. B. Butterfield, C. A. Frost

LASL

J. B. Donahue, P. A. M. Gram, M. E. Hamm, R. W. Hamm

University of Connecticut

W. W. Smith

Our observation of the Feshbach resonance in the photodetachment spectrum of H⁺ has revealed it to be more narrow than our experimental energy resolution, yet realistic calculation of its width is a most important challenge to modern theoretical methods. We propose to measure the lifetime itself by measuring the distance traveled by the photoexcited ions before they decay. Further, we propose to search for the very narrow recursions of that state which are presently obscured by the short-lived continuum states. Theoretical expectations for the lifetime of the Feshbach resonance range from 6×10^{-13} seconds to 2.8×10^{-11} seconds. The apparatus will be basically the same as that used successfully in Experiments 339 and 449, with the addition of a special purpose magnet in the interaction region that maps the origin of a decay electron into the angle its trajectory makes with respect to the beam. A modified electron detector measures the distribution of these angles with sufficient precision to determine lifetimes in the range 6.4×10^{-11} s to 4.3×10^{-12} s.

Exp. 589

**FREE-FORWARD np ELASTIC-SCATTERING ANALYZING POWER
MEASUREMENTS AT 800 MeV**

Texas A&M University

G. C. Glass and L. C. Northcliffe, Spokesmen

T. S. Bhatia, J. C. Hiebert, R. A. Kenefick, R. W. Tippens

LASL

B. E. Bonner, J. E. Simmons

University of Texas, Austin

G. W. Hoffmann, C. L. Hollas, R. D. Ransome, P. J. Riley

We propose to measure the forward angle free np elastic scattering analyzing power at 800 MeV. The experiment requires at least 10 nA of longitudinally polarized protons to be converted to polarized neutrons when scattered from a 25-cm-long LD₂ target. The angular range covered will be between 6 and 30° in the c.m. with three detector positions. A 26-cm-long LH₂ target will be used as the scattering target and the scattered neutrons will be detected through their charge-exchange reaction in a beryllium block, 15 cm thick. The resultant protons will be energy selected using range absorber and time-of-flight techniques. The measurement precision will be ± 0.03 , compatible with existing measurements at larger angles.

Exp. 590

**MEASUREMENT OF $D(\theta)$ IN p-n AND n-p SCATTERING at 800,
650 MeV AND OTHER ENERGIES WITH ASSOCIATED p-p MEASUREMENTS**

Texas A&M University

L. C. Northcliffe, Spokesman

T. S. Bhatia, G. C. Glass, J. C. Hiebert, R. A. Kenefick, W. B. Tippens

LASL

J. E. Simmons, Spokesman

J. J. Jarmer

Using two complementary methods, it is proposed to measure the Wolfenstein depolarization parameter, $D(\theta)$, for p-n and n-p scattering at 800 and 600 MeV over a large angular range. Angles in the forward hemisphere would be measured by quasifree p-n scattering of an incident polarized proton beam on a liquid deuterium target. An excitation function at 90° c.m. is also proposed for D from 500 to 800 MeV at standard LAMPF energies. These measurements may be considered to be an extension of approved Experiment 457. A carbon polarimeter would be used to analyze proton polarization. Proton-proton measurements are also proposed for the purpose of calibrating the polarimeter and to verify p-p $D(\theta)$ measurements at several energies and angles. For backward angles an unpolarized neutron beam would be scattered from a polarized target, with measurement of recoil proton polarization. All measurements are proposed for area BR. The primary motivation is to obtain new p-n and n-p data that will lead to unambiguous knowledge of the $J = 0$ amplitudes.

Exp. 591

**AN INVESTIGATION OF INCLUSIVE ONE PION PRODUCTION
IN PROTON NUCLEUS COLLISIONS**

LASL

R. M. DeVries and N. J. DiGiacomo, Spokesmen

M. R. Clover, J. C. Peng, W. E. Sondheim, J. W. Sunier

From the reaction $p + A \rightarrow \pi^+ + X$ we propose to measure $\sigma\pi^+(E_p)$, $\sigma\pi^-(E_p)$, $d^2\sigma(E_p)/d\Omega dE_\pi$ over ranges $0^\circ < \theta < 180^\circ$ and $20 \text{ MeV} < E_\pi < 500 \text{ MeV}$ for three proton energies between 500 and 800 MeV, on ^{12}C , ^{27}Al , ^{58}Ni , and ^{208}Pb using a 180° magnetic spectrometer at EPB (or Line B).

Exp. 592

**AN INVESTIGATION OF TWO PION PRODUCTION AND CORRELATIONS
IN PROTON NUCLEUS COLLISIONS AT 800 MeV**

LASL

R. M. DeVries and N. J. DiGiacomo, Spokesmen

M. R. Clover, J. C. Peng, W. E. Sondheim, J. W. Sunier

We propose to study the reaction $p + A \rightarrow \pi^+ + \pi^+ + X$ at $E_p = 800 \text{ MeV}$, measuring $\sigma 2\pi^+(E_p)$, $\sigma 2\pi^-(E_p)$ and $\sigma \pi^+\pi^-(E_p)$ as well as $d^2\sigma/d\Omega dE_\pi$. We will also search for correlations between the two pions. This experiment will be performed using a 180° magnetic spectrometer at EPB (or Line B).

Exp. 593

**MEASUREMENT OF THE SPIN ROTATION AND DEPOLARIZATION PARAMETERS
IN THE $^{12}\text{C}(\text{p},\text{p}') \text{ REACTION TO THE } 1^- \text{ 12.72 MeV } T \approx 0 \text{ AND TO THE } 1^- \text{ 15.11 MeV } T = 1 \text{ LEVELS}$**

University of California, Los Angeles

M. Bleszynski, J. B. McClelland, and C. A. Whitten, Jr., Spokesmen

B. Aas, E. Bleszynski, G. J. Igo, G. Pauletta

Rutgers University

C. Glashauser

At the HRS facility this experiment will use the focal plane polarimeter together with polarized proton beams [normal (N), transverse (S) and longitudinal (L)] to measure the Wolfenstein triple-scattering parameters $D_{NN}(q)$, $D_{SS}(q)$ and $D_{LS}(q)$ the $^{12}\text{C}(\text{p},\text{p}')$ excitation of the 1^- levels at 12.72 MeV ($T = 0$) and 15.11 MeV ($T = 1$). These parameters will be measured over a range of laboratory angles between 3 and 9° at an incident proton energy of 500 or 800 MeV. As will be discussed in the text of this proposal, the measurements proposed in this experiment, combined with previous measurements of $d\sigma/d\Omega_{\text{unpolar}}$ and $A(q)$ will provide a wealth of information concerning both the spin dependent N-N amplitudes and the nuclear form factors (transverse and longitudinal) relevant to these transitions. In particular, within the context of the single-scattering approximation, certain linear combinations of the measured data are directly proportional to the product of a **single** spin-flip amplitude squared and a nuclear transition form factor (transverse or longitudinal) squared. Thus, the measurements proposed here are a very sensitive test of the reaction mechanism and will measure both specific pieces of the complete N-N amplitude and also the nuclear transition form factors. Such information may in turn shed some light on the possible effects of precursor phenomena connected with pion condensation for the transition to the $T = 1 \text{ 15.11 MeV } 1^-$ level in ^{12}C .

Exp. 594

**PRECISION DETERMINATION OF THE RELATIVE MUONIC COULOMB
CAPTURE RATIOS IN OXIDES OF DIFFERENT VALENCES**

University of Mississippi

J. J. Reidy, Spokesman

LASL

R. L. Hutson

Negative muons at SMC (Cave A) will be stopped in oxide targets and line intensities of the muonic x rays from the metal and the oxygen in the target will be measured. The total Lyman line intensity from the metal, divided by the total Lyman line intensity from the oxygen, is proportional to the muon Coulomb capture ratio. By running selected pairs of different oxide targets (with the same oxidized element) simultaneously and detecting the x rays with a Ge(Li) detector, one will be able to determine the ratio of Coulomb capture ratios for oxide pairs with an uncertainty of less than 1%. This is about an order of magnitude better than previous determinations and should provide a definitive answer as to whether a valence effect exists in muon capture. This higher precision may provide additional constraints to the formulation of models of muon capture. Time is also requested so the muonic line intensities from pure oxygen can be measured. This will provide line-intensity ratios from pure oxygen which can then be compared with those oxygen line intensities from other oxygen containing compounds.

Exp. 595

**AN ON-LINE γ -RAY STUDY OF PION-INDUCED SINGLE NUCLEON
REMOVAL REACTIONS ON ^{13}C AND ^{48}Ca**

LASL

D. J. Vieira and C. J. Orth, Spokesmen

G. W. Butler, B. J. Dropesky, W. Faubel, J. D. Knight, L.-C. Liu

College of William & Mary

H. O. Funsten

Utah State University

V. G. Lind

Florida State University

H. S. Plendl

George Mason University

B. J. Lieb

We propose to measure the cross sections for populating particle-bound excited states of products from single-nucleon-removal (SNR) reactions ($\pi^+, \pi^- N$) on enriched ^{13}C and ^{48}Ca targets at 180 MeV, using on-line detection of deexcitation γ -rays in coincidence with either incident pions (Phase 1) or outgoing scattered pions (Phase 2). Furthermore, for ^{13}C , γ -ray singles spectra will be recorded during beam-off periods in order to extract the total cross sections for the reaction $^{13}\text{C}(\pi, \pi p)^{12}\text{B}$ ($T_{1/2} = 20.4$ ms). Finally, standard activation techniques will be utilized to measure the total cross sections for the reactions $^{48}\text{Ca}(\pi, \pi n)^{47}\text{Ca}$ ($T_{1/2} = 4.5$ days) and $^{48}\text{Ca}(\pi, \pi p)^{47}\text{K}$ ($T_{1/2} = 18$ s). These measurements are designed to provide data with which to test the role of nucleon charge exchange in the exit channel for SNR reactions on neutron-rich nuclei. Should nucleon charge exchange in the exit channel occur preferentially on "valence" nucleons rather than with equal probability on all nucleons in the nucleus, as assumed in the present Sternheim-Silbar N-CEN model, the measured $\sigma(\pi, \pi n)/\sigma(\pi, \pi p)$ ratios would be expected to be considerably larger for ^{48}Ca than predicted.

Exp. 596

**AN EXPERIMENTAL TEST OF GENERALIZED WHEELER-FEYNMANN
ABSORBER THEORY BY DIRECT OBSERVATION OF MUON-NEUTRINO RECOIL**

University of Washington

John G. Cramer, Spokesman

LASL

C. L. Morris, Spokesman

University of Texas, Austin

W. J. Braithwaite, C. F. Moore, Spokesmen

C. J. Harvey, K. Kallianpur, I. B. Moore

University of Minnesota

S. J. Tripp

We propose to measure the directional neutrino decay of the pion. This experiment is based on a generalized form of Wheeler-Feynmann absorber theory. Experimentally we plan to look for an anisotropy in the emission direction of muon decay of the pion, which, in the pion center of mass, is anticorrelated with the direction of neutrino decay. The muon laboratory emission direction will be determined using two-dimensional, angle-sensitive wire chambers, with intrinsic angle resolution better than 1 mrad.

Exp. 597

**THE STUDY OF BROAD RANGE PION INELASTIC SCATTERING SPECTRA
(With Emphasis on the Excitation of the Giant Monopole Resonance)**

University of Washington

I. Halpern, Spokesman

K. Aniol, D. Storm

Carnegie-Mellon University

R. A. Eisenstein, Spokesman

W. R. Wharton

LASL

J. F. Amann, R. L. Boudrie

There are two (compatible) parts to this proposal. One is to see how well the strength of the giant monopole nuclear resonance can be measured with 67-MeV pions at very forward angles. There are reasons to believe that this resonance may appear more cleanly in pion inelastic spectra than it does in spectra with other projectiles. The second part of the proposal involves extending the results of a survey of inelastic pion scattering below 100 MeV to forward angles. These angles were inaccessible in our LEP measurements because of muon backgrounds.

We would hope to run at full beam intensity and are applying for 60 shifts on the EPICS channel. The main technical problem which we anticipate comes from the huge muon background at forward angles. A short run by Jim Amann with a range-veto system shows promise of helping reduce the muon background to a manageable level. We have already been granted nine shifts for a feasibility study which we would like to do as soon as possible. We are asking here for regular production time assuming that our test runs establish feasibility.

Exp. 598

INELASTIC PION SCATTERING TO THE UNNATURAL PARITY LEVELS IN ${}^6\text{Li}$

New Mexico State University

W. B. Cottingham, Spokesman

S. J. Greene

University of Texas, Austin

C. F. Moore

University of Minnesota

D. B. Holtkamp

We propose to study the energy dependence of inelastic π^- scattering from ${}^6\text{Li}$ to the 0^- state at 3.56 MeV across the (3,3) resonance. Our intent is to determine if the energy dependence of these well known unnatural parity states have the similar striking characteristics as that recently determined for the tentatively assigned 4^- states in ${}^{12}\text{C}$ at 19.3 MeV.

The excitation function for the ${}^{12}\text{C}$ 4^- state has created much theoretical interest in unnatural parity transitions and information concerning unnatural parity transitions to the well known 0^- state in ${}^6\text{Li}$ will prove useful.

The EPICS facility is capable of the required incident pion energies of 60 to 200 MeV at the lab angles near the maximum in the angular distribution. Therefore, 220 h of beam time are requested.

**ISOSPIN MIXING MEASUREMENTS USING THE π^+ vs π^-
INELASTIC SCATTERING REACTION ON ^{40}Ca**

University of Texas, Austin

C. F. Moore, Spokesman

W. J. Braithwaite, C. J. Harvey, P. A. Seidl

LASL

C. L. Morris, Spokesman

Pion-nucleon elastic scattering on the (3,3) resonance favors $\pi^+ + p(\pi^- + n)$ over $\pi^+ + n(\pi^- + p)$ by the factor 9:1. Thus, a comparison of π^+ inelastic scattering with π^- inelastic scattering on complex nuclei should furnish the information necessary to extract both the proton and neutron amplitudes in inelastic scattering to excited states.

We propose to measure inelastic scattering from ^{40}Ca of both positive and negative pions at resonance energies. In this experiment we will study two important nuclear structure aspects of ^{40}Ca : (1) particle-hole states resulting from a ($d_{3/2}$ hole, $f_{7/2}$ particle) configuration, unnatural parity states near 8 MeV, and (2) isospin mixing in ^{40}Ca .

These unnatural parity states in ^{40}Ca result from a particularly simple shell model configuration, enabling the theoretical analysis to yield much information on shell model potentials as well as residual interactions. The isospin mixing aspect of the experiment is important in determining fine details of nuclear wave functions as well as examining the possibility that there is a charge dependent part of the nuclear force.

Exp. 600

**π^- vs π INELASTIC EXCITATION OF HIGH-SPIN, UNNATURAL
PARITY STATES IN ^{208}Pb**

University of Texas, Austin

C. F. Moore, *Spokesman*

W. J. Braithwaite, C. J. Harvey, P. A. Seidl

University of Minnesota

N. M. Hintz, *Spokesman*

M. Gazzaly, M. A. Franey, S. J. Tripp

LASL

C. L. Morris

Argonne National Laboratory

B. Zeidman

Massachusetts Institute of Technology

J. Lichtenstadt

We propose measuring π^- and π inelastic cross sections for excitation of the high-spin, unnatural parity states (12_1^- , 12_2^- , 14^-) in ^{208}Pb at $E_\pi \approx 180$ MeV at three angles. These states are of fundamental interest in the study of particle-hole interactions in nuclei. At present there is apparent disagreement between the (e,e') and 135 MeV (p,p') data as to the relative amplitudes of neutron and proton 1p-1h configurations in the 12^- states. Because of the 9:1 ratio between the $\pi^- + p$ (or $\pi^- + n$) and $\pi + n$ (or $\pi + p$) cross sections at the (3,3) resonance we can expect to obtain an accurate decomposition of the 12^- states into neutron and proton components. As a calibration target we plan to measure the 6^- $T = 0$ and $T = 1$ states in ^{28}Si where isospin conservation ensures equality of neutron and proton amplitudes in the wave function.

Exp. 601

**DETERMINATION OF ISOSCALAR AND ISOVECTOR TRANSITION
RATES FOR LOW-LYING COLLECTIVE STATES IN ^{90}Zr
AND ^{208}Pb by π^- AND π INELASTIC SCATTERING**

University of Minnesota

N. M. Hintz, *Spokesman*

M. Gazzaly, M. A. Franey, S. J. Tripp, K. Owen, D. Cook

LASL

C. L. Morris

University of Texas, Austin

C. F. Moore, P. Seidl

We propose to measure cross sections for π^- and π inelastic scattering to low-lying collective states in ^{90}Zr and ^{208}Pb . The purpose of the experiment is to obtain separate neutron and proton transition matrix elements, or the isoscalar and isovector transition rates. These rates are of fundamental importance to theories of nuclear collective vibrations. Independent measurements of the isoscalar and isovector rates have been made recently by comparing electron scattering with 800-MeV proton scattering on these and other nuclei. The results obtained by the two methods (e vs p and π^- vs π scattering) can be compared to test the validity of the reaction theories used to extract the transition rates from the experimental cross sections.

Exp. 602

**NEUTRON-PROTON COMPONENTS OF INELASTIC TRANSITIONS
IN PION SCATTERING ON ^{23}Na AND ^{25}Mg**

University of Texas, Austin

C. J. Harvey, Spokesperson

C. F. Moore, W. J. Braithwaite

University of Minnesota

D. Dehnhard, Spokesman

S. J. Tripp, D. B. Holtkamp

LASL

C. L. Morris, J. F. Amann, R. L. Boudrie

Michigan State University

B. H. Wildenthal

We propose measuring angular distributions on the (3,3) resonance for π^- and π^+ inelastic scattering from ^{23}Na and ^{25}Mg , at five angles between 20 and 60°. The specific aim of this experiment will be to obtain $\sigma(\pi^-)/\sigma(\pi^+)$ cross-section ratios for both the strong intra-band and weak inter-band $\ell = 2, 3$, and 4 transitions to the low-lying states in these strongly deformed nuclei. From these measurements both neutron and proton transition strengths will be extracted and compared with collective-model and recent shell-model predictions.

Exp. 603

**SEARCH FOR DELTAS IN A COMPLEX NUCLEUS BY A
RADIOCHEMICAL TECHNIQUE**

University of Chicago

A. L. Turkevich, Spokesman

D. Boyce

Lakehead University

J. Warren

Purdue University

H. R. Heydegger

LASL

B. J. Dropesky, C. J. Orth, J. D. Bowman, H. S. Matis

The presence of Δ^{++} in a complex nucleus (^{88}Sr) is to be studied by determining the cross section for the production of ^{88}Kr from strontium by $\sim 750\text{-MeV}$ neutrons. A mechanism is postulated based on an elastic collision of the incoming neutron with a pre-existing Δ^{++} :

Estimates (taking into account attenuation effects inside the nucleus, a 35-mb cross section for n, Δ^{++} isotropic scattering, decay of the Δ^{++} after collision, and up to 7-MeV excitation of the

residual ^{88}Kr suggest that a 1% presence of Δ^{++} in ^{88}Sr will result in an $\sim 8\text{-}\mu\text{b}$ cross section for forming ^{88}Kr by $\sim 750\text{-MeV}$ neutrons. Estimates of two-step processes inside the nucleus (e.g., n, p followed by $p, p\pi^+$), secondary reactions, proton-induced reactions, and reactions with impurities indicate that the contributions from these should be less than $0.3\text{ }\mu\text{b}$.

It is proposed to irradiate $\sim 160\text{ g}$ of $\text{Sr}(\text{NO}_3)_2$ by neutrons produced by $3\text{ }\mu\text{A}$ of 800-MeV protons in a 10-cm beryllium target in Line B. The sample will be placed as close as possible to the neutron producing target (e.g., at the upstream end of the steel wall in Area B). After about 5 h of irradiation, the salt will be removed, dissolved, and the ^{88}Kr (2.8 h) separated and purified. The 18-m ^{88}Rb daughter of ^{88}Kr will be collected on a charged wire and, with a 35-min cycling time, measured in a special low-level counting system. An event rate of $\sim 4\text{ m}^{-1}$ is expected from an $8\text{-}\mu\text{b}$ cross section. Four shifts are requested. The experiment should have a sensitivity of $\sim 0.03\%$ Δ^{++} in ^{88}Sr on the basis of the mechanism proposed.

Exp. 604

AN INVESTIGATION OF THE NEAR-STABILITY OF ^6H

Northwestern University

K. K. Seth, Spokesman

D. Barlow, M. Bosco, S. G. Iversen, M. O. Kaletka, A. Saha, D. Smith

It is proposed to study the stability of near-stability of the "super exotic" nucleus, ^6H , by means of the reaction

at the EPICS facility. The study of this reaction should help us to verify the very provocative suggestion about the near stability of ^6H , which has resulted from our recent study of the pion double-charge-exchange reaction on ${}^7\text{Li}$.

Exp. 605

A DIBARYON SEARCH AT EPICS

Northwestern University

K. K. Seth, Spokesman

D. Barlow, M. Bosco, S. G. Iversen, M. O. Kaletka, A. Saha, D. Smith

It is proposed to make a study of the suggested dibaryon structures by means of the reaction

in the energy range $T(\pi^-) = 200$ to 300 MeV . This energy range is equivalent to the energy range $T(p) = 700$ to 900 MeV in the study of the inverse reaction $p + p \rightarrow d + \pi^-$ which is being used for dibaryon searches in many approved LAMPF, SIN, and SACLAY experiments. The proposed experiment has not only the obvious advantage of extending the range of dibaryon investigations at LAMPF to $T_p = 900\text{ MeV}$ but also the ability to examine fine structure that may be missed in the proton-induced reactions because of the unavoidable limits on the energy steps in which LAMPF beam energy may be varied.

Exp. 606

TESTS OF THE (N-Z) DEPENDENCE OF PION DOUBLE CHARGE EXCHANGE

Northwestern University

K. K. Seth, Spokesman

D. Barlow, M. Bosco, S. G. Iversen, M. O. Kaletka, A. Saha, S. Smith

It is proposed to measure the differential cross sections for the analog transitions in the double-charge-exchange reactions $^{48}\text{Ca}(\pi^+, \pi^-)^{48}\text{Ti}$ and $^{48}\text{Ti}(\pi^+, \pi^-)^{48}\text{Cr}$ at $\theta = 5^\circ$ in order to test the theoretical predictions for the N-Z and A dependence of pion double-charge-exchange reactions. Since essentially all calculations available at present make the same prediction about the ratio of these DCX cross sections and the ratio of the DCX cross sections for ^{48}Ca and ^{42}Ca targets, it is expected that the proposed measurements will provide a most crucial test of some of the most basic common assumptions of all current theories of pion double charge exchange.

Exp. 607

STUDY OF ISOVECTOR GIANT RESONANCES WITH PION CHARGE EXCHANGE

Tel Aviv University

J. Alster, Spokesman

A. Doron, A. Ereli, M. A. Moinester, LASL/Tel Aviv

LASL

H. W. Baer and J. D. Bowman, Spokesmen

M. D. Cooper, M. J. Leitch, H. S. Matis, N. S. P. King, F. H. Cverna

We propose to search for the as yet unobserved isovector EO resonance as well as the E1 giant dipole resonance and higher resonances using the (π^-, π^0) reaction. Cross sections are estimated to be approximately 400 $\mu\text{b/sr}$ for the EO resonance and approximately 1 mb/sr for the E1 resonance. Such large cross sections will be easily observable using the LAMPF π^0 spectrometer. We propose to study spherical targets of the well-known nuclear structure from ^{40}Ca to ^{208}Pb at $T_\pi = 100$ and 160 MeV and values of qR (momentum transfer $\times$ nuclear radius) from zero to four. The successful observation of isovector resonances in pion charge-exchange reactions at medium energies would open a fruitful field of nuclear structure research.

Exp. 608

INELASTIC SCATTERING OF PIONS TO GIANT RESONANCES

LASL

N. S. P. King and R. L. Boudrie, Spokesmen

H. W. Boudrie, Spokesmen

H. W. Baer, C. L. Morris

University of North Carolina

R. E. Anderson, Spokesman

Oak Ridge National Laboratory

F. E. Bertrand

University of Colorado

J. J. Kraushaar, R. J. Peterson, R. A. Ristinen

This proposal is an extension of Experiment 522 entitled "Giant Resonance Studies in ^{90}Zr and ^{208}Pb with 150-MeV Pions." That experiment was very successfully completed in March 1980, and a large amount of excellent data were obtained. We have verified that the more well known resonance states (GQR, GDR) are strongly excited in both π^- and π^+ scattering, especially to isovector states. We feel that 522 was so successful that additional work is warranted. Thus, this proposal will outline the series of experiments that we feel will document the behavior of the giant resonance states (including the virtually unknown isovector resonances between 20- and 30-MeV excitation). This series consists of four basic experiments.

1. We will determine the bombarding energy dependence of giant resonance excitation between $T = 70$ and 290 MeV in order to resolve current disagreements which exist and to be able to choose on a realistic basis the bombarding energy for the other studies.
2. We will examine the π^- and π^+ differences as a function of $N - Z$ in a sequence of isotopes. Either $^{40,42,44}\text{Ca}$ or $^{112,124}\text{Sn}$ will be chosen based on preliminary data.
3. We will tune the spectrometer to carefully examine the region between 20- and 30-MeV excitation in order to resolve the question of the population of possible isovector excitations at these energies.
4. We will expand the mass range for which pionic excitation of giant resonance states has been observed to include heavier targets such as ^{208}Pb .

Recent theoretical calculations make feasible a detailed understanding of the excitation of giant resonance states with pions. We feel that it is not unrealistic to expect a quantitative understanding of both the magnitude of the cross section and the origin of the differences between the π^- and π^+ probes to emerge.

Exp. 609

$\bar{\nu}$ OSCILLATION EXPERIMENTS AT LAMPF

LASL

H. W. Kruse, Spokesman

J. Toevs, R. S. Loncoski, J. M. Mack, C. Smith, A. R. Brown, E. Austin, G. Stephenson,
R. Slansky, R. L. Burman, T. J. Bowles

University of Mississippi

R. Kelly

A detector, now under construction, is to be used at the Nevada Test Site (NTS) to study possible neutrino oscillations in connection with fission bomb tests. It is proposed that this detector be evaluated, prior to NTS use, at LAMPF, in such a location that cosmic backgrounds may be recorded and, if backgrounds are indeed as low as estimated, an interesting neutrino oscillation experiment may be performed as well.

The experiment utilizes techniques used previously and would record neutrino events by

$$\bar{\nu}_\mu + p \rightarrow n + \beta^+.$$

Such reactions would occur only if $\bar{\nu}_\mu \rightarrow \bar{\nu}_\nu$ occur since the $\bar{\nu}_\mu$ produced in the beam stop would not otherwise interact. This type of experiment complements the NTS experiment where possible $\bar{\nu}$ oscillations of length comparable to the observation distance, are manifest by extinction of the signal rate with distance, faster than inverse r^2 .

Sensitivity of the proposed experiment to a determination of δm^2 is dependent upon the backgrounds to be measured, the number of detectors and the counting time. Estimated signal rates and backgrounds give δm^2 of 0.1 eV^2 with one detector in 110 days. At the present time, one

detector is authorized and others are pending administrative decision. Based upon the experience with one detector, the sensitivity for the technique can be accurately predicted for the case of other detector numbers and other counting times.