NAL PROPOSAL No. 220

Scientific Spokesman

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Experimental Proposal for NAL 30" BC

$\bar{p}p$ and K^-p Interactions at 100 GeV/c

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T. Nozaki, K. Tamai, H. Kichimi, T. Okusawa, S. Noguchi,
T. Maruyama, R. Kikuchi and Y. Unno (Tohoku University)

May 25, 1973

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Experimenters:

T. Kitagaki, S. Tanaka, K. Abe, K. Hasegawa, A. Yamaguchi, T. Nozaki, K. Tamai, H. Kichimi, T. Okusawa, S. Noguchi, T. Maruyama, R. Kikuchi and Y. Unno (Tohoku University)

Presented May 25, 1973

Spokesman:

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An exposure of 50K picture in the 30" hydrogen-filled bubble chamber to $\bar{p}$ and K^- of 100 GeV/c is proposed. This proposal is an experiment connected to our 15' BC proposal, NAL No. 83, technically and the importance of the physics requests here a similar experiment at the 30" BC. Therefore, the most of explanations in the detail of experiment and physics are very close to that of the 15' BC proposal.

Unseparated negative beam is sent to the 30" BC, and a kicker and BC flash are triggered by an incoming $\bar{p}$ or K^- particle through the mass tagging system. By the triggering device most of pictures contain a $\bar{p}$ or K^- particle, and the number of beams per picture is in average cut down to a half of the number of beams originally sent to the BC per expansion. If we carefully consider figures, it is seen that the use of 15' BC really shows the merits of this scheme for the small content of $\bar{p}$ or K^- in the unseparated beam. Also it is obviously true that the 15' BC has the capability for the detailed study of $\bar{p}p$ and K^-p interactions at the 100 GeV/c region.

However, the recent several experiments using the 30" BC on pp and π^-p interactions at this energy region did explore a quite exciting views on multiplicities or so. Here, this proposal is written for both reasons of (a) urgent request on physics which is to study the quite unexplored region of $\bar{p}p$ and K^-p interactions on the quantities shown on pp and π^-p within the limitation of 30" BC, and (b) to obtain the most fundamental parameters on the expected 15' BC experiment in the same triggering scheme and connect to the 15' BC experiment technically.

1. Physics interest

a. The total cross section

The total cross sections of any reactions are decreasing slowly with increasing s, and it had been supposed to level off to the high energy limit according to the Pomeranchon exchange. However, the recent two experiments at the CERN-ISR showed unexpected results,[1] that is, the pp total cross section increases about 10% in the energy range of 500 to 1500 GeV. If the $\bar{p}p$ and pp total cross sections are assumed to coincide at the high energy limit and the ISR data are correct, then $\bar{p}p$ total cross section is expected to pass through a rather sharp U-turn above 100 GeV. Therefore, it is interesting and urgent to know the $\bar{p}p$ total cross section above 100 GeV. The K^-p total cross section at 100 GeV/c is also measured, and it gives us other data for anti-particle induced reaction.

b. Charged multiplicity and π^o multiplicity

The available highest energy data of $\bar{p}p$, at 15 GeV/c, show that the charged multiplicity distribution fits well with the Poisson distribution.[2,3]* For the pp reaction, much higher energy data are already available[4,5] and the two component view has been presented[6] against the conventional theoretical expectations. The proposed experiment will show us whether the similar phenomenon occurs or not for the $\bar{p}p$ and K^-p reactions.

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* see Fig. 1.

The correlation of the neutral pion multiplicity with the charged multiplicity is one of the most important thought to study the production mechanism of the neutral pion. The correlation in the 15 GeV/c $\bar{p}p$ reactions is found to be different much from that in the pp reactions at the same energy region, and it is considered to be due to the additional annihilation channel.[2] The feature will be studied at 100 GeV/c.

c. An inclusive cross section of $K^o/\bar{K}^o$ in pp interaction at hundred GeV/c region is considerably increased comparing with those at a few ten GeV/c, whereas the cross section of Λ/Σ^o is slowly increased.[7,8,9] It is reported that a scaling of $K^o/\bar{K}^o$ inclusive spectrum in Feynman variable, x, starts at 200 GeV/c in pp interaction.[8,9]

For inclusive reactions with γ a scaling in x and a factorization as function of longitudinal and transverse momentum are reported to hold in the range from 200 GeV/c to ISR energy.[9,10,11] These quantities will be examined in $\bar{p}p$ in the proposed experiment.

d. It is pointed out that for an inclusive reaction;

$$a + b \rightarrow c + \text{anything},$$

the momentum spectrum of particle c will reach some limit at a comparatively low energy if $(ab\bar{c})$ system is exotic.[12]

Negative pion spectra at the target fragmentation region actually show a limit for pp, π^+p and K^+p interactions at several ten GeV/c.[13]

On the other hand, such a limit for $\bar{p}p$ reaction is expected to be at a very high energy because $\bar{p}p$ system is non-exotic, if the model is correct. In this proposal inclusive spectra of single particles and also of resonances will be studied mainly at the target fragmentation region.

2. Experiment

Schematic view of experimental arrangement is shown in Fig. 2. The major points of the experimental method are;

a. Negative charged beam from the external target bombarded by 400 GeV/c protons (or the highest energy practically available) is momentum selected and sent to BC.

b. The mass-tagging system constructed for the 30" BC is used. A set of gas Cerenkov counter for $\bar{p}$, K^- and (π^-, μ^-, e^-) and the positioning entrance wire chamber array.

c. A beam kicker and the flash of 30" BC are triggered by an incoming $\bar{p}$ or K^- particle.

d. Alternate method is the triggering by a rear wire chamber set, which detects the multiparticle interactions induced by the mass tagged $\bar{p}$ or K^- in chamber.

In this triggering experiment the $\bar{p}$ and K^- fractions in the incoming beam at BC, $R_{\bar{p}} = \bar{p}/\text{all}$ and $R_{K^-} = K^-/\text{all}$, are very important factors to decide the triggering rates. The most of evaluations of R are, however, just the extrapolation from the PS energy region, and the final accurate values of R will be obtained in this experiment.

A couple of extrapolated estimations [14] suggest that the

ratio R is around $R_{\bar{p}} = 0.016$ and $R_{K^-} = 0.018$ at zero degree for $\bar{p}$ and K^- of 100 GeV/c, respectively by bombarding Be target with 400 GeV/c proton.* There K^- decay is taken into consideration.

In this proposal, the number of beams per expansion is limitted to 14 and the average number of incident beams appeared in a picture is expected as less than 7 in average considering both the use of a kick magnet and the effect of the interactions in the front wall.

The triggering rates are about 0.48. 50K pictures at the energy will give us the usable events of 1.1K $\bar{p}p$ and 0.7K K^-p in a fiducial volume of 45 cm. (Table 1)

* see FIG.3

3. Apparatus

The mass tagging system being constructed for the 30" BC is used. Especially, the gas Cerenkov counter (π, K and $\bar{p}$ tagging) and the kicker magnet are used.

4. Analysis

It is planned to use manual measurement for this first high energy $\bar{p}p/K^-p$ pictures of 50K. Ten universal projectors with variable magnigications, x14 and x40, will be mainly worked for scanning and measuring. About three months of careful measurement is estimated.

The analyzing program of TVGP-WQUAW system is used.

The following computers are used for analysis;

a. TOSBAC 3400 model 51 (Bubble Chamber Analysis Center, IBM 7090 equivalent).

b. NEAC 2200 model 700 (Tohoku University Computer Center IBM 7090 x 15 equivalent).

Manpower for the analysis in the Tohoku University group is,

1 Professor

2 Associate Professor

5 Research Associates

6 Technicians

5 Graduate Students

30 Scanners

References

1) CERN Courier No.3 Vol.13, 1973, U. Analdi et al. Phys. Lett, B43,(1973) 231.

2) H. Kichimi, The Ph.D thesis (Tohoku Univ.), The inclusive Study of the γ-ray produced at the 15 GeV/c $\bar{p}p$ interactions.

3) J. Lach, Private Communication

4) G. Charlton et al. P.R.L. 29, (1972) 515.

5) F. T. Dao et al., P. R. L.29 (1972) 1627.
J. Lach and E. Malamud, NAL-77, 7200.037.

6) J. W. Chapman et al., P. R. L. 29, (1972) 1686,

7) B. Y. Oh and G. A. Smith, Nucl. Phys. B49, (1972) 13.

8) G. Charlton et al., P. R. L. 30, (1973) 574.

9) F. T. Dao et al., NAL-PUB-73/21-EXP 7200.037 UCLA-1071

10) G. Charlton et al., P. R. L. 29, (1972) 1759.

11) G. Neuhoffer et al., P. L. 38B, (1972) 51.

12) Chan Hong-Mo et al., P. R. L. 26 672(1971)

13) M. S. Chen et al., P. R. L. 26, 1585(1971)

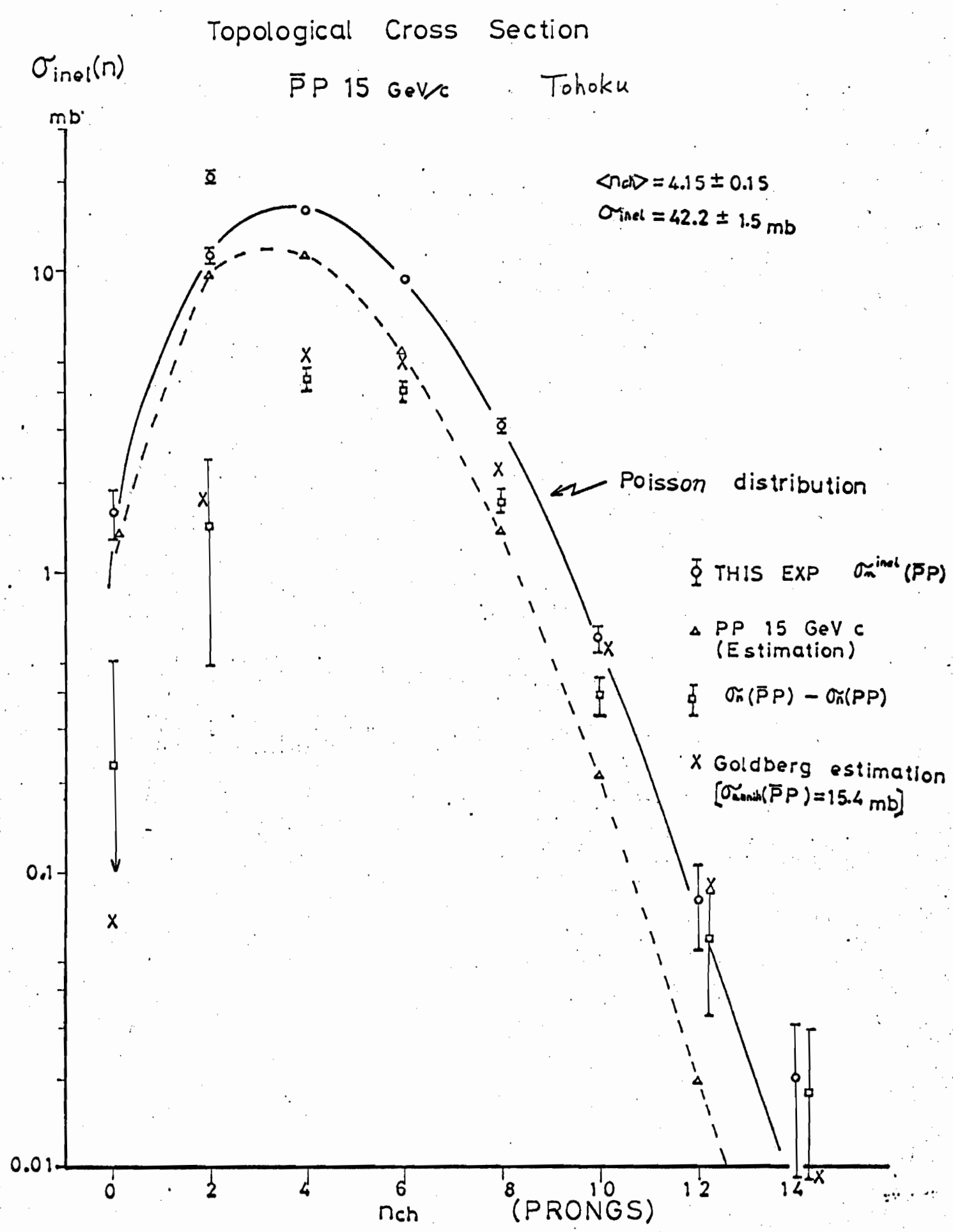
14) J. Lach and S. Pruss, TM-285, 2254.000, Hadron Beams in the neutrino area.

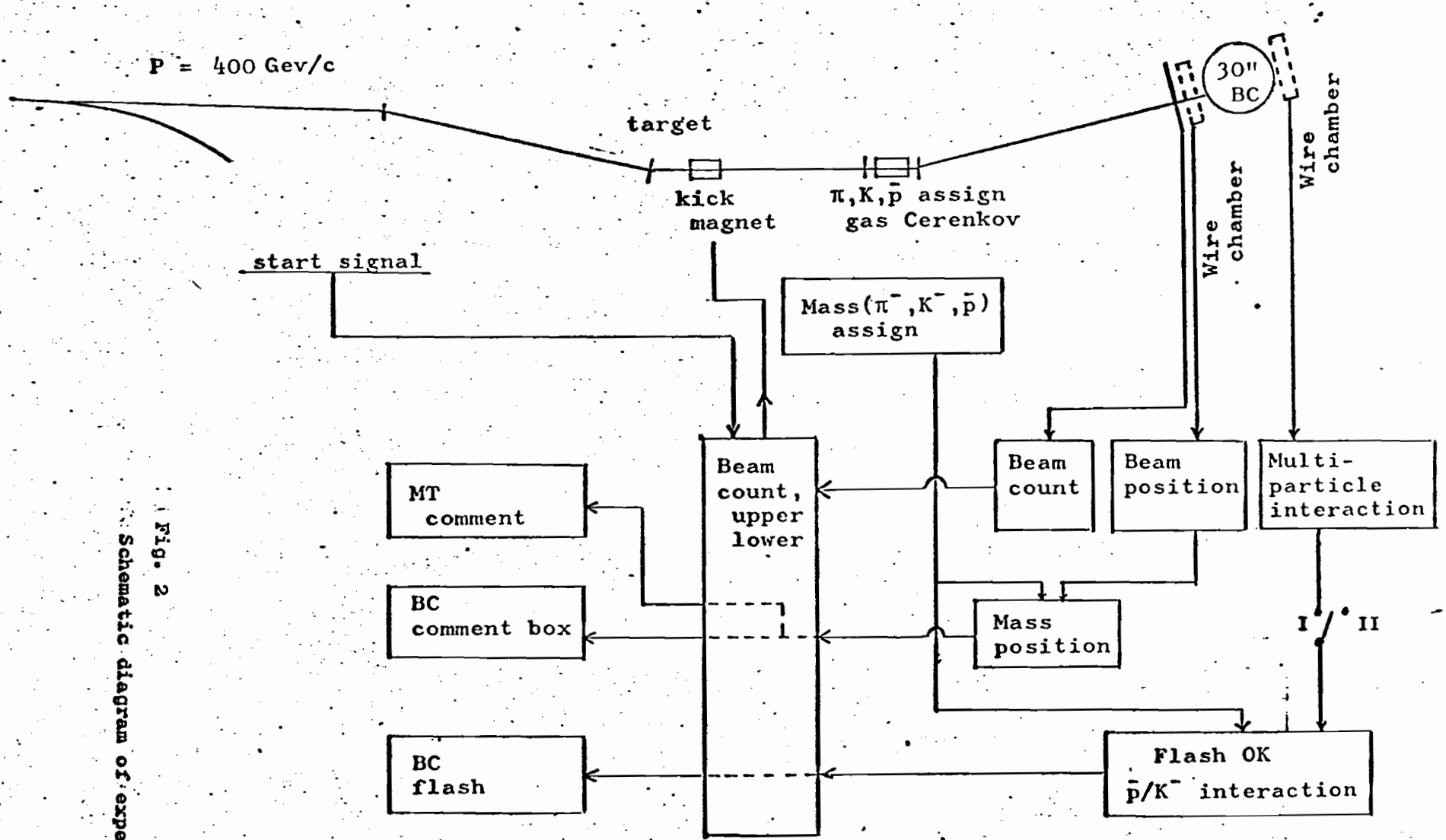
Table I Triggering rates and interactions (30" BC)

B= number of beams per expansion	14
average beams per pix	$\lesssim 7$

Beam momentum	50 GeV/c		100 GeV/c		150 GeV/c	
estimated fraction of special particle	$\bar{p}$	K^-	$\bar{p}$	K^-	$\bar{p}$	K^-
Ri = (i)/all	0.030	0.012	0.016	0.018	0.008	0.013
A. Mass triggering rate partial rate= BRi	0.420	0.168	0.244	0.252	0.155	0.175
Total rate = $B\sum Ri$	0.59"		0.48		0.29	
pictures	50K		50K		50K	
expansion	84K		104K		172K	
Wanted interactions in 45cm hydrogen	1.67K	0.38K	1.11K	0.69K	0.57K	0.48K
B. Interaction triggering rate partial rate	0.0424	0.0123	0.0226	0.0184	0.0116	0.0128
Total rate	0.055		0.041		0.024	

Fig. 1


Topological Cross Section
$\sigma_{inel}(n)$
$\bar{P}P$ 15 GeV/c
Tohoku
mb
$\langle n_{ch} \rangle = 4.15 \pm 0.15$
$\sigma_{inel} = 42.2 \pm 1.5$ mb
Poisson distribution
THIS EXP $\sigma_n^{inel}(\bar{P}P)$
PP 15 GeV c (Estimation)
$\sigma_n(\bar{P}P) - \sigma_n(PP)$
X Goldberg estimation
$[\sigma_{annih}(\bar{P}P) = 15.4$ mb$]$
10
1
0.1
0.01
0
2
4
6
8
10
12
14
n_{ch}
(PRONGS)



I . Flash by $\bar{p}/K^-$ interaction in chamber

II. Flash by $\bar{p}/K^-$ incoming

Fig. 2 Schematic diagram of experiment

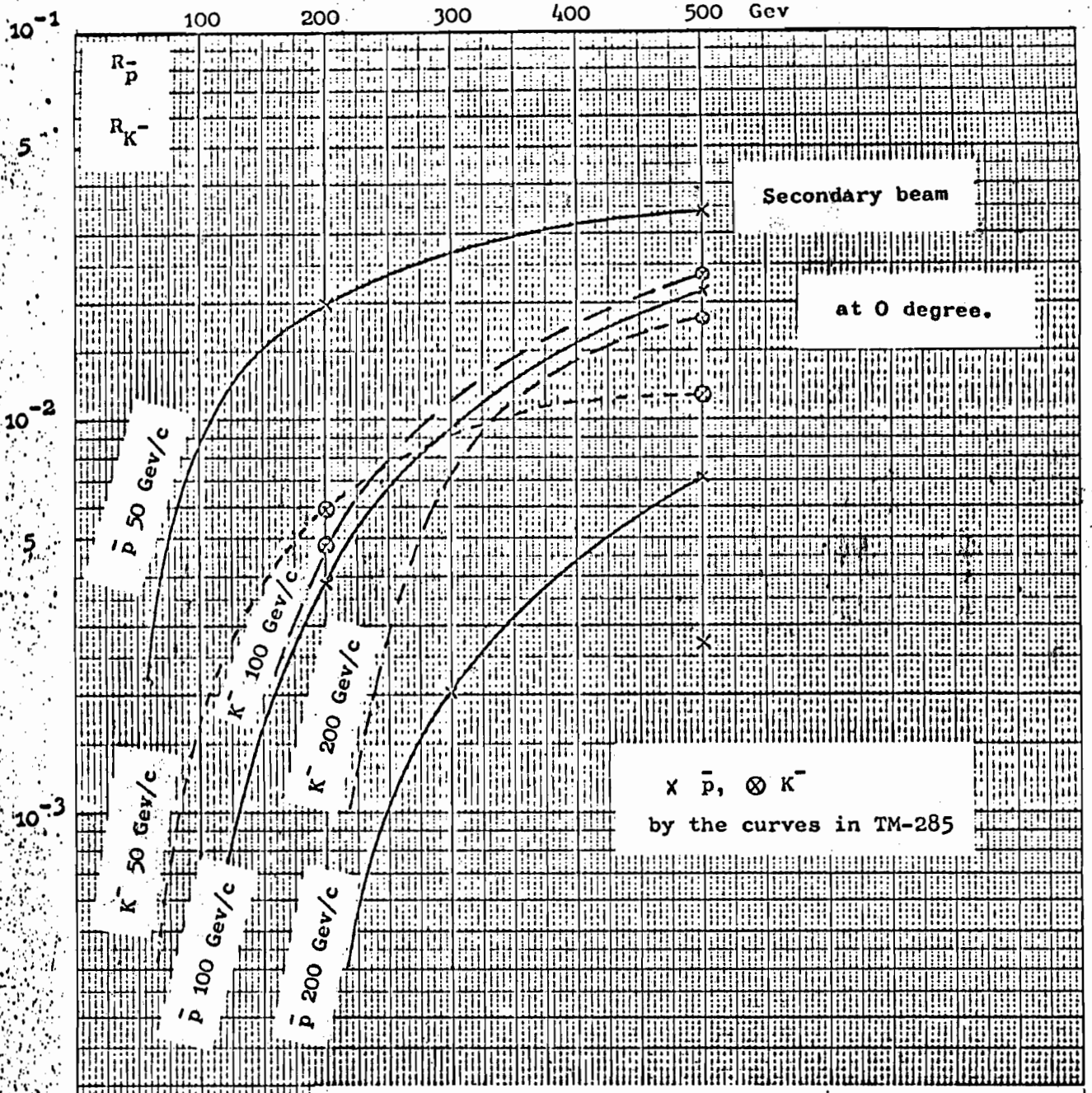


Fig.3 Fraction of $\bar{p}$ / K^- vs. primary proton energy, K^- decay is considered.

$R_{\bar{p}} = \bar{p}$ / all

$R_{K^-} = K^-$ / all

	Gev/c	300 Gev	400 Gev
$\bar{p}$	50	0.026	0.030
	100	0.010	0.016
K^-	50	0.009	0.012
	100	0.012	0.018

national accelerator laboratory

TM-336A
2800

RESEARCH PROPOSALS SUBMITTED TO NAL SORTED ACCORDING TO PHYSICS TOPICS AND THE CURRENT STATUS OF THE PROPOSALS

(Through Proposal No. 171)

J. R. Sanford

National Accelerator Laboratory

May 16, 1972

Operated by Universities Research Association Inc. Under Contract with the United States Atomic Energy Commission

CONTENTS

Status

1. Hadron Interactions - Counter Experiments

A. Search and Survey

Rejected — #11A Y. Kim (Ohio State, Ind. State, Rose Polytechnic, Kansas, NAL)

Search for Fast Particles Produced at Large Lab Angles at NAL.
Includes search for tachyons, quarks.

Approved 12-70 — #48 R. Adair (Yale, BNL, NAL)

A Measurement of the Intensity and Polarization of Muons Produced Directly by the Interactions of Protons with Nuclei.

Approved 12-70 — #63 J. Walker (NAL)

Survey of Particle Production in Proton Collisions at NAL.

Approved 12-70 — #70 L. Lederman (Columbia, Harvard, NAL)

Study of Lepton Pairs From Proton-Nuclear Interactions; Search for Intermediate Bosons and Lee-Wick Structure.

Approved 8-70 — #72 L. Leipuner (BNL, Yale)

Experimental Proposal to NAL Quark Search.
Secondary beam search for particles of fractional charge.

Approved 8-70 — #75 T. Yamanouchi (NAL)

A Proposal to Search for Fractionally Charged Quarks.
Secondary beam search for particles of fractional charge.

Approved 6-71 — #95A B. Cox (Johns Hopkins, NAL)

Proposal for Examination of Wide Angle Gamma Rays at NAL.

Approved 2-71 — #100 J. Cronin (Univ. of Chicago, Princeton)

A Proposal to Study Particle Production at High Transverse Momenta.

Status

1.B. Total Cross Sections

Inactive
See 104

#10 W. Baker (NAL)

A Proposal to Measure Total Cross Sections for $\pi^{\pm}$, $K^{\pm}$, p, $\bar{p}$.

Inactive
See 104

#56 R. Cool (Rockefeller, BNL)

Measurement of Total Cross Sections on Hydrogen and Deuterium.

Rejected
3-71

#57 S. Lindenbaum (BNL, Yale, NAL)

Behavior of High Energy Elastic Scattering and Total Cross Sections for $\pi^{\pm}$-p, $K^{\pm}$-p, p-p, and $\bar{p}$-p.

Approved
8-70

#104 T. Kycia (BNL, Rockefeller, NAL)

Measurement of Total Cross Sections on Hydrogen and Deuterium.

Status

1.D. Inelastic Scattering

Approved 3-71

#14 P. Franzini (Columbia, SUNY)

Proposal to Study Inelastic High-Energy Proton-Proton Collisions in the Diffractive Region.

Defer 8-71

#18A G. O'Neill (Princeton, Pavia)

Proposal to Study the Reactions
$pp \rightarrow p(n\pi^+)$
$p(p\pi^\circ)$
$p(p\pi^+\pi^-)$
at 200 GeV

Approved 8-71 (qualified)

#23A J. Rothberg (Washington)

Inclusive πp and Kp Scattering.
Study of $\pi + p \rightarrow \pi +$ anything; test scaling law.

Inactive See 111

#55 A. Tollestrup (Cal. Tech)

Proposal to Study $\pi^- p \rightarrow \pi^\circ n$ and $\pi^- p \rightarrow \eta n$ at High Energy.

Inactive See 96

#64 A. L. Read (NAL, ANL, Bari, Brown, CERN, Cornell, MIT)

Hadron Spectra From High Energy Proton-Proton Interactions.
Particle production, elastic and inelastic p-p scattering.

Approved 2-71 (qualified)

#67 B. Maglic (Rutgers, Upsala, Mississippi State)

Search for Baryon Resonances Up to 10 GeV Mass Produced in $p + p \rightarrow p +$ MM with a Resolution of ±25 MeV.

Inactive See 110

#68 H. Anderson (Univ. of Chicago)

Multiparticle Production in π-p Collisions at 100 GeV.
Elastic π-p cross-sections, mesonic missing mass search, particle distribution in mesonic cascades, coherent diffraction; uses UC cyclotron magnet.

Inactive See 111

#84 T. Jenkins (Case Western Reserve Univ.)

Proposal for an Experiment to Study the Reaction $\pi^- p \rightarrow \pi^\circ n$ at 30 to 150 GeV at NAL.

Status

1.E. Multiparticle Inelastic Events

Inactive See 110	#35	D. McLeod	(Univ. of Ill. - Chicago Circle)

A Proposal to Study Resonance Production in $\pi^- p \to X^- p$ at 40 to 80 GeV/c.

Inactive See 110	#43	D. Miller	(Purdue)

Proposal to Study Single Meson Production in Meson Nucleon Interactions at 50 to 100 GeV/c.

Approved 11-71	#51	E. von Goeler	(Northeastern, Stanford)

Mass Spectrum and Decay Modes for Bosons in the 2.0 to 8.6 GeV/c^2 Mass Range.

Defer 8-71	#52B	H. Weisberg	(Penn.)

A Proposal to Study Particle Production Spectra and Multiplicities in High Energy Hadron-Hadron Collisions, and for a Beam Survey and Quark Search.

Inactive See 110	#54	J. Pine	(Cal Tech, UCLA, NAL)

Quasi-Two-Body Reactions at 50-200 GeV.
s and t dependence of peripheral processes;
search for new meson and baryon resonances;
π-π and π-K scattering via pion exchange.

Defer 8-71	#59A	L. Holloway	(Univ. of Illinois)

A Proposal to Study the Reaction $\pi^- p \to \pi^- \pi^+ n$.

Approved 5-71 (with constraints)	#86A	H. Lubatti	(Univ. of Wash., ORSAY)

A Proposal to Study Inelastic Diffractive Processes by Observing Coherent Production of Multi-Pion Final States from He Nuclei.

Rejected 5-71	#106	D. Miller	(Northwestern, ANL, Michigan State)

Proposal for a Study of Multiparticle Production at NAL Using an Array of Wide-Gap Triggerable Spark Chambers.

Approved 4-72	#110	J. Pine	(Cal Tech, NAL, SUNY, UCLA, Univ. of Illinois)

The People's Spectrometer.
A proposal for multiparticle physics using a magnetic spectrometer.

Status

1.F. Hyperon Interactions

Approved 8-70

#8 L. Pondrom (Wisc., Michigan)

Experiments in a Neutral Hyperon Beam. Beam survey; search for $\Delta S = 2$ decay; σ_{tot}, $d\sigma$ for $\Lambda^\circ p$, $\bar{\Lambda}^\circ p$ scattering.

Approved 8-70

#97 J. Lach (NAL, Yale)

Elastic Scattering of the Hyperons.

Small angle scattering of negative hyperons Σ^-, Ξ^-, Ω^-; (also Σ^+, $\bar{\Xi}^+$ and $\bar{\Omega}^+$ if mass resolution permits) for $|t| \sim 0.1$ to 0.6 $(GeV/c)^2$. Search for leptons $> 10^{-11}$ sec.

Defer 11-71

#149 R. Winston (Chicago, Ohio State, ANL)

A Proposal for Experimental Research on the Weak Interaction of Hyperons at NAL.

Active

#168 T. J. Delvin (Rutgers, Wisconsin, Michigan)

Measurement of the Σ° Lifetime*.

Status

1.H. Neutron Experiments

Approved 8-70

#4-I M. Longo (Michigan, ANL)

Neutron-Proton Diffraction Scattering and Neutron Total Cross Sections up to 200 GeV.
4-I is the measurement of total cross sections.

Approved 8-70

#4-II M. Longo (Michigan, ANL)

Neutron-Proton Diffraction Scattering and Neutron Total Cross Sections up to 200 GeV.
4-II is the measurement of diffraction scattering.

Approved 8-70

#12 N. Reay (Ohio State, Mich. State, Carleton)

A Study of Neutron-Proton Charge-Exchange Scattering in the Momentum Range 50-200 GeV/c.

Approved 3-71 (tentative)

#27A J. Rosen (Rochester, NAL, Northwestern)

Proposal to Study the Coherent Dissociation of Neutrons.

Rejected 8-71

#112 M. Kreisler (Michigan, Princeton Univ.)

Neutron Diffraction Dissociation and Coulomb Dissociation from Various Nuclei.

Status

2.A. Fifteen-Foot Bubble Chamber (continued)

Active #85 L. Gutay (Purdue)

Proposal for an Exposure of the 15-Foot Deuterium Filled Bubble Chamber to a Beam of Separated π^+ Mesons at 40 GeV/c at NAL.

Active #89 W. Fretter (Univ. of Calif. Berkeley)

Interactions of 150 GeV π^- Mesons in a Large NAL Bubble Chamber Filled with H_2-Ne.

Status — 2.B. NAL/ANL 30" Bubble Chamber (continued)

Inactive
See 138

#80A T. Ferbel (Rochester)

Proposal to Study Multiparticle-Production Processes Utilizing the 30-Inch Bubble Chamber
General survey, 80Kπ^- pix at 70 and $\gtrsim$250 GeV/c.

Rejected
8-26-71

#88 V. Hagopian (Florida State University)

NAL Bubble Chamber Proposal Search for Fractionally Charged Particles.
Quark search, 2×10^4 pictures, half with negative beam.

Approved
8-26-71

#121A R. Lander (University of Calif., Davis)

A Proposal To Search for Very Heavy Strange Particles Using a Small Hydrogen Bubble Chamber.
$\pi^+ p$, 50K pictures.

Approved
8-27-71

#125 D.R.O. Morrison (CERN)

Proposal to Study $\pi^- p$ Reactions at 60 and 200 GeV/c in the 30 Inch Hydrogen Bubble Chamber at NAL.
$\pi^- p$, 50K pictures.

Withdrawn
4-10-72

#126 V. E. Barnes (Purdue)

Multiparticle $\pi^- p$ Interactions at 130 GeV/c and at the Highest Energy.
Uses optical spectrometer of #2; 200K pictures with negative beam at each of 130 and 300 GeV/c.

Withdrawn
See 154

#127 B. Eisenstein (Illinois)

A Proposal to Study Slow Secondary Particle Distributions in $\pi^- p$ and pp Reactions in the 30-Inch Bubble Chamber.
General survey with bare chamber; total of 200K pictures divided among π^- and p at 50, 150 and 300 GeV/c.

Active
8-71

#128 A. Benvenutti (Wisconsin)

Search for Mossbauer Type Nuclear Collisions with High Energy Protons.
Heavy target in front of HBC hit by proton: 600K pictures.

Active
8-71

#129B W. F. Fry (Wisconsin)

An Investigation of the Components of the Neutral Beam Produced by High Energy Protons at NAL Using the 30" Bubble Chamber.
Use HBC to look at 30-100 mr neutral production; 20K pictures initially.

Status	2.B. NAL/ANL 30" Bubble Chamber (continued)	
Approved 8-26-71	#138-I T. Ferbel	(Rochester, Michigan)
	Study of Multiparticle Production in a 30" Bubble Chamber. 50K pix with highest energy protons available.	
Approved 8-26-71	#138-II J. VanderVelde	(Michigan, Rochester)
	Study of Multiparticle Production in a 30" Bubble Chamber. 50K pix with highest energy protons available.	
Approved 8-26-71	#141-A T. H. Fields	(ANL)
	Study of pp Interactions in the ANL 30-Inch Hydrogen Bubble Chamber at NAL. 50K pix with highest energy protons available.	
Approved 8-26-71	#143 G. Kalbfleisch	(BNL)
	Proposal For a Rapid Systematic Study of All Interactions in a π^-p Exposure of the Bare 30" Chamber at 120 GeV/c. 50K pix with ~200 BeV π^-.	
Active	#145 J. K. Walker	(NAL)
	A Proposal to Study Photon Proton Interactions Between 20 and 250 GeV. Photon-Proton interactions from 20-250 GeV in 30" bubble chamber.	
Active	#153 T. Kitagaki	(Tohoku University)
	Negative Pion - Proton Interactions at 200 GeV/c.	
Approved 8-71	#154 I. A. Pless	(MIT, Brown, Ill., Ind., Johns Hopkins, IIT, Rutgers-Stevens, Yale, NAL)
	Test of Proportional Wire Chambers in Hybrid Systems. Feasibility Study of Proportional Chamber Hybrid systems with 30-inch bubble chamber.	
Active	#157 A. R. Dzierba	(Caltech., LBL)
	A Proposal to Study High Energy Diffractive N* Production.	

Status

3. Neutrino Experiments

A. Using Counters

Approved 10-70

#1A D. Cline (Wisc., Penn., Harvard)

NAL Neutrino Proposal
Search for W to 10 GeV/c^2; 4-fermion interactions; deep inelastic ν scattering; σ_{tot} for hydrogen.

Approved 10-70

#21 B. Barish (Cal Tech., NAL)

Neutrino Physics at Very High Energies.
Search for W to 15 GeV/c^2; deep inelastic ν scattering; σ_{tot} vs energy to 300 GeV for several A.

Rejected 11-70

#38 J. Walker (NAL, ANL, MIT, Northwestern Pittsburgh)

Production of W's and Study of Deep Inelastic Reactions by Very High Energy Neutrinos.

Status

3.B. Including the Fifteen-Foot Bubble Chamber (cont'd)

Rejected 12-71

#92A F. Sciulli (Cal Tech.)

A Neutrino Experiment in the NAL 30m^3 Bubble Chamber Using "Monoenergetic" Neutrinos.

Active

#122A A. A. Volkov (Inst. High Energy Physics, Serpukhov)

On Investigation of Neutrino Interaction with the 15-foot Bubble Chamber at NAL.

Defer 12-71

#151A G. Snow (Maryland, Ill. Inst. Tech.)

A Study of Neutrino Interactions with Neutrons and Protons Using the 15-Foot Bubble Chamber at NAL Filled with Deuterium.

Approved 12-71

#155 M. L. Stevenson (LBL, Hawaii)

Proposal to Develop a Phase I External Muon Identifier (EMI) for use with the NAL 30m^3 Bubble Chamber.

Status

4. Emulsion Experiments (continued)

Active

#171 J. J. Lord (Univ. of Washington)

Proposed Emulsion Experiment Search for Short Lived Particles at High Energies.

Status

6. Monopole Search

Approved 8-70

#3 P. Eberhard (LBL, SLAC)

Proposal for a Search for Magnetic Monopoles at NAL.
Separation from beam dump target after removal.

Approved 2-71

#19A D. Tompkins (Univ. of Wyoming)

A Search for Monopole Production by 200-500 GeV Protons.

Approved 8-70

#22 G. Collins (VPI, BNL)

Experimental Proposal to the NAL for a Search for Multigamma Events from Magnetic Monopole Pairs.
Search for multi-gamma events from monopole pairs.

Approved 8-70

#74 R. Fleischer (GE, NAL)

Proposal to National Accelerator Laboratory for a Search for Magnetic Monopoles.
Parasitic search using special (plastic?) detectors.

Approved 8-70

#76 R. Carrigan (NAL)

Search for Magnetic Monopoles Produced at NAL.
Counters and magnets used to search for free, bound monopoles.

Status

8. Muon Experiments

Withdrawn 10-70	#5	M. Perl	(SLAC)
	Muon-Proton Inelastic Scattering.		
Approved 8-70	#26	L. Hand	(Cornell, Mich. State, UCSD)
	High Momentum Transfer Inelastic Muon Scattering and Test of Scale Invariance at NAL.		
Inactive see 98	#29	R. Wilson	(Harvard)
	Proposal for μP Scattering Experiment at NAL.		
Inactive see 98	#33	L. Mo	(Univ. of Chicago, Penn., NAL)
	Preliminary Proposal to Measure the Hadrons in Muon-Proton Inelastic Scattering at the National Accelerator Laboratory.		
Approved 1-71	#98	L. Mo	(Univ. of Chicago, Harvard, NAL)
	Muon-Proton Inelastic Scattering Experiment at the National Accelerator Laboratory.		

10. Cross Reference Index

Proposal #	Category	Spokesman	Status
1	3-A	D. Cline	Approved
2	2-B	G. A. Smith	Approved
3	6	P. H. Eberhard	Approved
4	1-H	M. J. Longo	Approved
5	8	M. Perl	Withdrawn
6	1-C	A. D. Krisch	Approved
7	1-C	D. Meyer	Approved
8	1-F	L. G. Pondrom	Approved
9	3-B	M. L. Stevenson	Defer
10	1-B	W. F. Baker	Inactive
11	1-A	Y. S. Kim	Rejected
12	1-H	N. W. Reay	Approved
13	1-G	T. Bowen	Inactive
14	1-D	P. Franzini	Approved
15	5	J. Steinberger	Rejected
16	1-C	L. T. Kerth	Rejected
17	2-A	B. G. Reynolds	Active
18	1-D	G. K. O'Neill	Defer
19	6	D. R. Tompkins	Approved
20	3-B	M. M. Block	Rejected
21	3-A	B. Barish	Approved
22	6	G. B. Collins	Approved
23	1-D	J. E. Rothberg	Approved
24	7	D. O. Caldwell	Active
25	7	D. O. Caldwell	Approved
26	8	L. Hand-K. W. Chen	Approved
27	1-H	J. Rosen	Approved
28	3-B	W. Fry	Approved
29	8	R. Wilson	Inactive
30	5	T. B. W. Kirk	Rejected
31	3-B	M. Derrick	Approved
32	1-G	R. Hofstadter	Approved
33	8	L. W. Mo	Inactive
34	1-G	R. W. Huggett	Approved
35	1-E	D. McLeod	Inactive
36	1-C	R. L. Cool	Approved
37	2-A	E. Malamud	Active
37-A	2-B	E. Malamud	Approved
38	3-A	J. Walker	Rejected
39	2-B	W. D. Walker	Withdrawn
40	2-A	R. B. Willman	Active
41	2-A	V. Barnes	Active
42	3-B	A. Garfinkel	Defer
43	1-E	D. H. Miller	Inactive
44	3-B	B. Roe	Defer
45	3-B	F. Nezrick	Approved
46	2-A	F. R. Huson	Active
47	2-B	I. Pless	Withdrawn
48	1-A	R. K. Adair	Approved
49	7	J. A. Poirier	Defer
50	1-C	J. Orear	Defer

Proposal #	Category	Spokesman	Status
106	1-E	D. Miller	Rejected
107	1-C	K-W. Lai	Rejected
108	9	M. Awschalom	Approved
109		K. P. Pretzl	Withdrawn
110	1-E	J. Pine	Approved
111	1-D	A. Tollestrup	Approved
112	1-H	M. N. Kreisler	Rejected
113	1-D	D. H. Miller	Inactive
114	4	P. L. Jain	Approved
115	1-A	M. L. Stevenson	Approved
116	4	J. Hebert	Approved
117	4	O. Kusumoto	Approved
118	1-E	J. Friedman	Active
119	9	C. J. Batty	Defer
120	1-A	D. Cline	Approved
121	2-B	R. L. Lander	Approved
122	3-B	A. A. Volkov	Active
123	1-A	Y. S. Kim	Defer
124	4	H. H. Aly	Inactive
125	2-B	D. R. O. Morrison	Approved
126	2-B	V. E. Barnes	Withdrawn
127	2-B	B. Eisenstein	Withdrawn
128	2-B	A. Benvenutti	Active
129	2-B	W. F. Fry	Active
130	2-B	R. Panvini	Rejected
131	2-B	D. H. Miller & D. Cords	Inactive
132	2-B	I. A. Pless	Inactive
133	2-B	W. D. Shephard	Inactive
134	2-B	V. P. Kenney	Inactive
135	1-D	T. L. Jenkins	Defer
136	2-B	W. D. Walker	Withdrawn
137	2-B	F. R. Huson	Approved
138	2-B	T. Ferbel/J. VanderVelde	Approved
139	7	E. Engels	Defer
140	1-D	D. Garelick	Rejected
141	2-B	T. H. Fields	Approved
142	9	R. Stoughton	Defer
143	2-B	G. Kalbfleisch	Approved
144	7	S. Ting	Active
145	2-B	J. K. Walker	Active
146	9	J. Hebert	Defer
147	9	J. Hebert	Defer
148	1-D	K. Ruddick	Defer
149	1-F	R. Winston	Defer
150	1-E	J. K. Walker	Active
151	3-B	G. Snow	Defer
152	7	C. Heusch	Active
153	2-B	T. Kitagaki	Active
154	2-B	I. A. Pless	Approved
155	3-B	M. L. Stevenson	Approved
156	4	K. Niu	Approved
157	2-B	A. R. Dzierba	Active
158	2-B	R. Sosnowski	Active
159	2-B	P. K. Malhotra & S. Ganguli	Active
160	5	U. Nauenberg	Active