fermilab report

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THE COVER: Alvin Tollestrup breaking ground for the Collider Detector Facility at B0. Watching and approving his technique are (l. to r.) Wayne Nestander, Fred Mills, and Leon Lederman, all of Fermilab, Andrew Mravca of the Department of Energy, and A. J. Maggio, the contractor who is building the facility. Dennis Theriot, who also participated in the ceremony, is out of the picture.
(Photograph by Fermilab Photo Unit)

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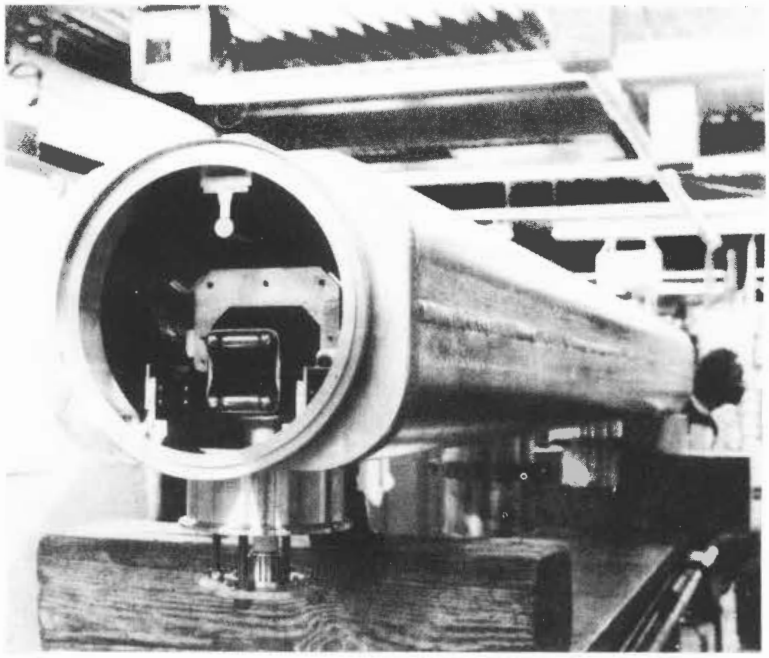


An improved two-way split electrostatic septum developed as part of the Tevatron II work.
(Photographs by Fermilab Photo Unit)

TEVATRON II

T. B. W. Kirk

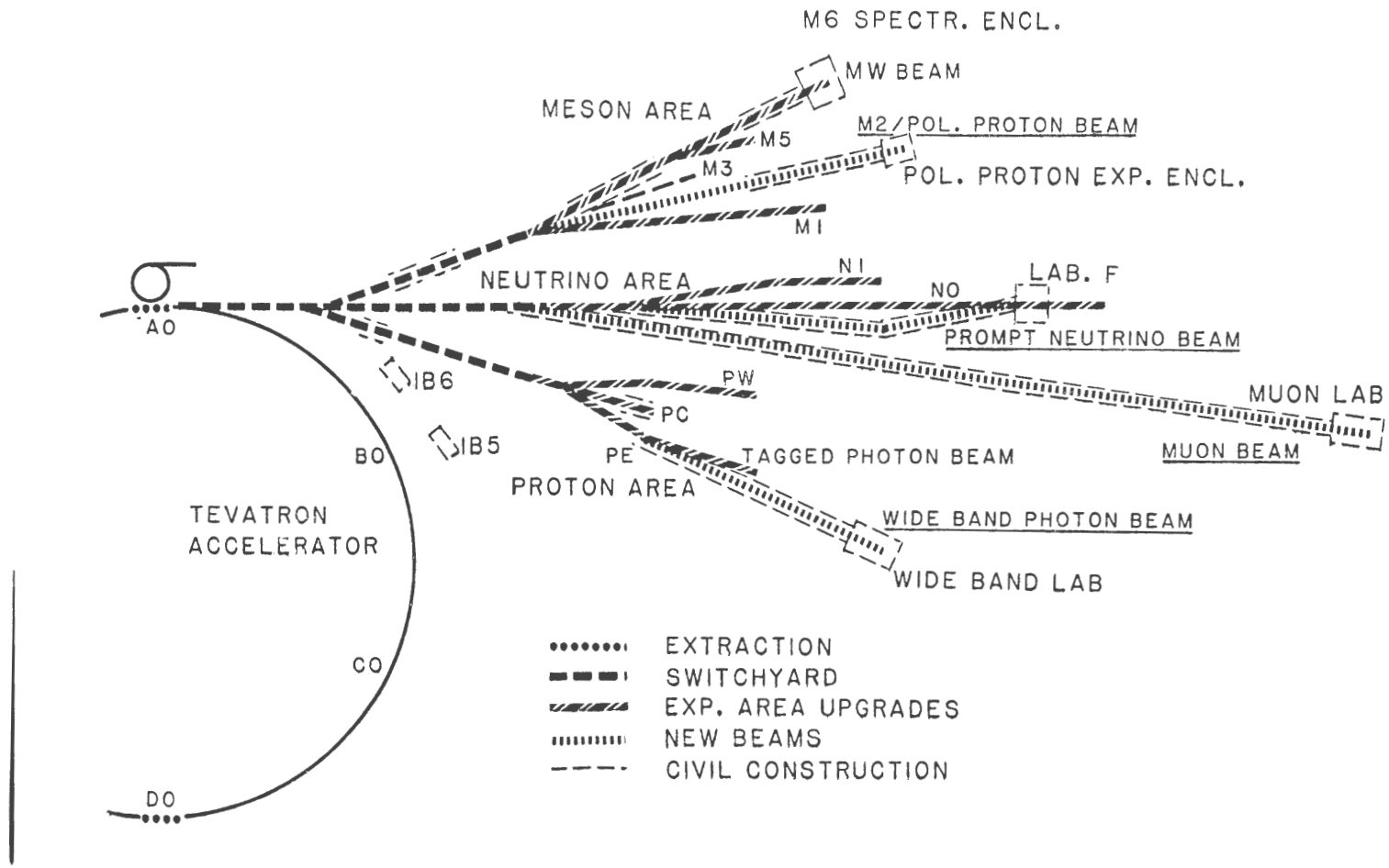
The main purpose of the Tevatron II project is to upgrade external beams and experimental areas to bring fixed-target physics into the TeV era. Extraction of slow spill beam from the superconducting accelerator is also included in the project. The project has not been discussed in these pages since April, 1980 and there has been enormous progress since that time. It is therefore appropriate to review the program, which is a major effort of both the Research and Accelerator Divisions. This report will cover many Fermilab people's work, as well as the contributions of many users.

Planning. The Tevatron II project touches closely on the aspirations of almost every user and it is entirely natural that there has been a deep, continuing involvement of users in the planning of the project. The basic design of Tevatron II was blocked out in a 1976 Aspen Summer Study with 65 participants. The papers from that study have been published in a two-volume Summer Study Report. There have been many workshops since that summer, including a Photon Workshop (80 people) in August, 1978, a Meson TeV workshop (100 people) in August, 1979, a Bubble-Chamber Physics Workshop (75 people) in October, 1979, a workshop on Tevatron Neutrino and Muon Physics (230 people) in January, 1980, a workshop on Hadron and Muon Physics (200 people) in May, 1980, a Fixed Target Workshop (200 people) in July, 1980, and a workshop on Holographic Techniques (90 people) in November, 1980. Users are continuing to be active in Tevatron II planning.

Pre-Project Work. By recognizing the future 1 Tev needs of the experimental areas in the normal upgrading programs of the past two years, it has been possible to get an advanced start on projects related to the goals of Tevatron II. A useful upstream extension to Neuhall was built in the summer of 1980 and 14,000 tons of additional steel shielding were buried in the muon absorber earth berm in the Neutrino Area. The entire superconducting Left Bend to the Meson Area has been installed and commissioned; it operated very reliably and successfully in the 400-GeV run that ended in June of this year. A number of other improvements and small construction additions have been made in the Meson and Proton Areas.

Project Status. The Tevatron II project is now a fully authorized construction line item. The total plant funds authorized for the project is $49.8 million. In addition, a total of $18 million in other funds will be spent for research and development associated with the project. There will be a substantial increase in equipment funding required to support the Tevatron II project for secondary beamline equipment and for equipment to be used in Tevatron experiments.

TEV II CONSTRUCTION AREAS



Present Work. The accompanying diagram shows the areas of construction work for Tevatron II. We are about to go out for bids on a large amount of civil construction to upgrade switch-yard tunnels and to reroute a number of primary beams. The beams to be affected are:

(i) the Wide Band Beam in the Proton Area, where in the future, both the Wide Band and Tagged Photon Beams will be generated by separate primary beams and separate targets,

(ii) the new Muon Beam,

(iii) the new Dichromatic Beam in the Neutrino Area, and

(iv) the new triple split of th primary beam in the Meson Area.

This last beam is the result of a complete rethinking and redesign of the beam and targeting system. The three primary beams in the new plan will go all the way into the Detector Building, which will become a primary target building.

A large amount of other conceptual and engineering design work and technical component construction is also in progress. A new prompt neutrino shield design using superconducting magnets has been completed. Work is in progress on designs for many special magnets needed in the project. Many other needed devices of various types are also being designed and built.

There is also a large ongoing research and development activity that supports project activity. A large-aperture low-current superconducting quadrupole has been designed and built at Argonne National Laboratory and brought (cold) to Fermilab for tests in the beam. The preliminary indication is that this magnet will be successful in a high-radiation area. Work is also going on to improve the electostatic septa on which low-loss extraction and beam splitting depend. By careful prestressing of the wire-support frames, it is possible to bring the projected septum width down to 3 mils for a wire diameter of 2 mils. This development represents a factor two improvement over existing septa and has important consequences for slow spill beam in the Tevatron.

Future Work. Next year we will build a number of new experimental halls. These include:

(i) Neutrino Lab F. This is an extension of Lab E for prompt neutrino physics and possibly for hadron experiments.

(ii) A new Wide Band Photon Experimental Hall in the Proton Area.

(iii) A new Muon Experimental Hall at the end of the new muon beam.

(iv) A new M-West Experimental Hall to house experiments in the upgraded M6 beam.

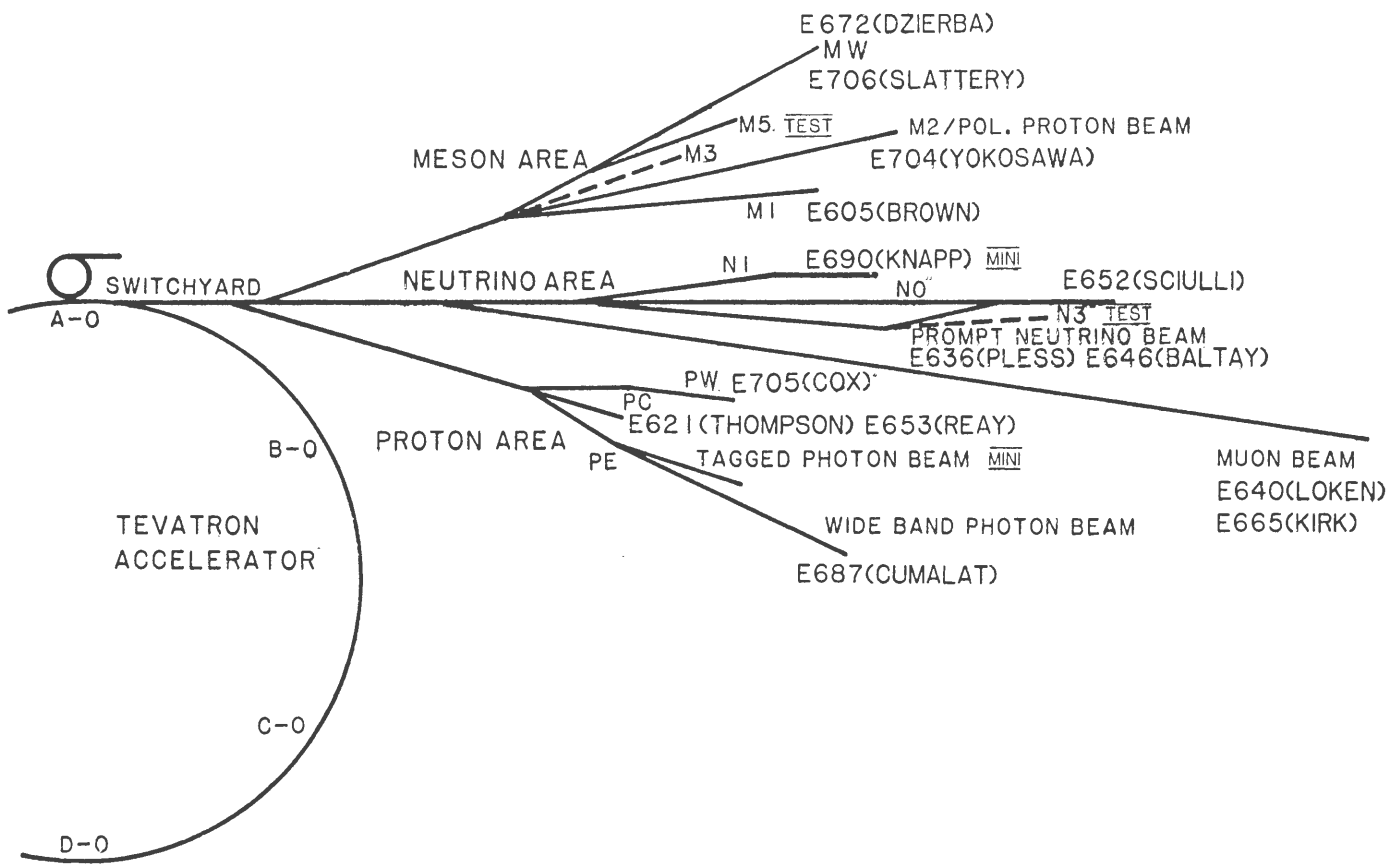
(v) A Polarized Proton Experimental Hall.

A polarized proton beam is being built in collaboration with Argonne National Laboratory. The beam is planned in two phases, a first phase utilizing conventional magnets at energies up to 200 GeV and a later phase that would utilize superconducting magnets to produce polarized beams at higher energies if the physics indicates this as an interesting direction to pursue.

Thus we are in high gear and moving ahead rapidly on our preparation for the future of fixed-target physics. We will finish the new experimental halls by the Fall of 1984 and will finish the entire project in 1985. In all this work, we continue to seek and will gratefully receive the advice of Fermilab users. Any work that can be donated to help in the concepted design will also be welcome.

The Physics Advisory Committee has approved a number of Tevatron experiments. A schematic layout of the first round of Tevatron experiments is shown in the accompanying drawing.

TEVATRON EXPERIMENTS



An aerial view of the construction of the helium storage facility. The Main Ring pond is in the foreground, the Central Helium Liquefier and the Substation beyond the Main Ring. (Photograph by Fermilab Photo Unit)

MAIN RING BEAM EXPERIMENTS FOR THE $\bar{p}p$ COLLIDER

J. E. Griffin

A brief description of the Tevatron I proton-antiproton Collider project appeared in these pages last month. Production, collection, and subsequent acceleration of anti-protons (and their proton counterparts) to 1 TeV will require operation of the Main Ring and the Tevatron in modes that are quite different from those used in the familiar fixed-target operation. Although these unusual operation modes appear to be straightforward in principle, there will almost certainly be unforeseen practical difficulties associated with their execution. Because of this, an effort has been underway for several years to demonstrate the feasibility of these operations in a series of accelerator experiments.[1]

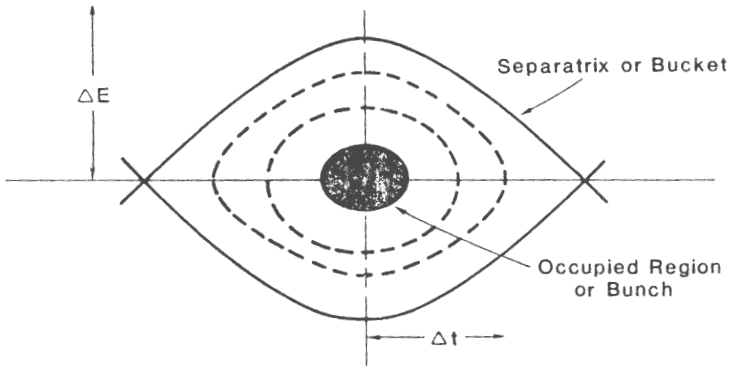
About 11 8-hour shifts of dedicated accelerator time were devoted to these studies during the most recent accelerator operation period, which was extended for a few days following the termination of HEP on June 14 to accommodate a short intensive period of study requiring some accelerator changes not consistent with interlaced HEP. During the extended operating period, use of the Main Ring was shared between our Tevatron I group and the Energy Saver group, who were studying extraction from the Main Ring for injection into the Energy Saver.

The primary experimentors were James Griffin, James MacLachlan, and Keith Meisner. Others, including Z. B. Qian, C. Ankenbrandt, S. Pruss, C. Moore, M. Rebuehr, R. Vargo, and J. Ziober, gave significant assistance. In addition, many members of the Accelerator Operations Group led by Robert Mau and William Merz provided much-needed assistance.

The Tevatron I operating scenario will require the Main Ring to accelerate only one intense Booster 'batch' (about 82 bunches) on each accelerating cycle instead of the usual 13 batches. This means that only a small segment of the ring (1/13.25) will contain bunches of protons during acceleration. A further requirement is that each of the 82 bunches of protons, when extracted from the Main Ring at 125 GeV and delivered to the antiproton production target, must have the shortest possible time length. This will result in a train of antiproton bunches with very large momentum spread, each with the same very short time structure, preferably 1 nanosecond or less. The empty space between bunches will be about 17.5 nanoseconds so that in a later operation (debunching) the antiproton distributions can be rotated in momentum and time so that the empty space is filled with particles and the momentum spread reduced accordingly.

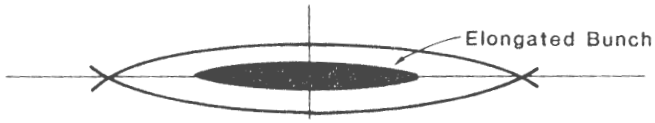
Protons within bunches in the Main Ring are confined to a region in time that is established by restoring forces resulting

Figure 1



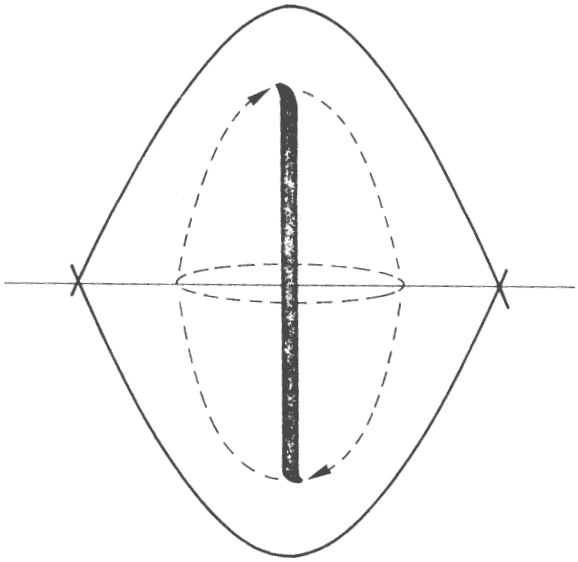
a.

Phase space separatrix established by application of rf voltage. Dotted lines represent possible paths of charged particle motion within the separatrix, or bucket. Cross-hatched area is that actually occupied by protons. The area, in e^{V}-sec, is the bunch longitudinal emittance.



b.

Here the rf voltage and bucket height have been lowered slowly until the bunch extent in time is about half of the rf bucket period.



c.

The bucket height is suddenly raised to a very large value. The distribution of part b is now mismatched to the boundary and so rotates into a tall narrow strip as shown.

from the rf cavity voltage. This voltage sets a boundary (separatrix, or bucket) within which each proton moves in energy and time on an elliptical orbit. If one were to plot the location of each proton within a bunch on coordinates of energy and time (or ΔE and Δt, where each is a deviation from some mean value), one would find an elliptical area occupied by protons, as shown in Fig. 1a. The area of the populated ellipse is called the longitudinal emittance of a bunch and has dimensions of electron-volt-seconds (eV-sec). The forces imposed by the rf system are such that the density of particles near any point in the distribution must remain constant (Liouville's theorem), although the average area occupied by particles can increase if the ellipse becomes distorted or mismatched to the boundary. Such an increase is called dilution or filamentation. A reduction in the occupied area is a much more difficult matter, accomplished only by special techniques presently beyond our reach in the Main Ring. Two things are immediately apparent. Making very narrow bunches must result in an increase in the energy spread of the bunches, the extent of which may be limited by the momentum aperture of the Main Ring, and any dilution of the bunches during acceleration will adversely affect our ability to make narrow bunches.

This creates several problems. The low-level rf system, which must provide the accelerating rf cavities with a driving signal of the correct frequency and phase, takes its information primarily from the beam itself through beam-signal pickups in the beam pipe. Because the single-batch beam is present at the pickup for less than 10 percent of the time, the system requires modification in order to minimize phase drift during the periods of each turn when no beam is present at the pickups. Such a phase drift will result in dilution of the longitudinal emittance. In addition, each time the single batch passes through the rf accelerating-cavity system, it induces in the cavities a large transient voltage of the wrong phase and amplitude that, when added to the 'correct' rf voltage developed by the system, has an adverse effect on the quality of some of the bunches in the batch. The existing 'full-ring' beam-loading compensation system is not able to compensate adequately for this repeated transient beam excitation, so a further modification of the low-level system is necessary in order to provide the required compensation. Yet another modification of the system is required in order that the 18 cavities can be excited in two separate equal groups and, at a command, the phases of the rf voltages delivered to the two groups be rotated 90 degrees in opposite directions so that the net accelerating voltage, and bucket height, can be reduced to an extremely small value, then suddenly returned to its full value. This requirement is dictated by the need for a beam manipulation that produces the narrow bunches.

In order to minimize the possibility that these modifications might adversely effect the subsequent normal fixed-target operation of the accelerator, an entirely separate low-level system was assembled specifically for these experiments. In this way, the required modifications were made with fewer restrictions

and the assembled system serves as a prototype for the system that will be needed for routine antiproton production.

During 400-GeV fixed-target HEP, the longitudinal emittance of the proton bunches is purposely diluted or blown up to a uniformly large value during acceleration by introducing controlled 'phase noise' into the rf system. This is done to improve the quality and smoothness of the extraction spill by making all bunches large, because it is known that some bunches are diluted by random noise or other disturbances and this nonuniformity of bunch size creates 'superbuckets' during extraction. This procedure is, of course, precisely what we do **not** want to do during antiproton production. An early experiment during the recent series was an attempt to measure the longitudinal emittance of selected bunches at the moment of injection by measuring bunch length and calculating the emittance such a length indicates in a known bucket. The selected bunches were then subjected to intentional phase disturbances and accelerated through transition (18.5 GeV) to 25 GeV, where the emittance was carefully measured again by measuring the bunch length, then measuring the rate at which the bunch debunches when the rf is removed, giving a measure of its energy spread. The goal was to understand the importance of mismatches in initial conditions of injection and to learn how much dilution occurs when mismatched bunches are accelerated through transition. The results of the experiment were not very useful because we found that we could not accurately assess the emittance by measuring bunch length alone. Our length measurement was not sufficiently precise at 8 GeV, where the bunches are quite long. This information came from a preliminary experiment in which we made the length measurement and a few milliseconds later, still at 8 GeV, made the second measurement by removing the rf and observing the debunching rate. A useful result did emerge, however.

We found that the longitudinal emittance of bunches of the required intensity, 3×10^{10} protons per bunch, is frequently 0.2 eV-sec at 8 GeV before acceleration is begun. This is somewhat larger than we had expected. The general impression is that much of the irregular dilution that we have been living with occurs very early in the acceleration cycle, probably at 8 GeV. In order to improve the situation, it may be necessary to improve the process of beam transfer from the Booster. In the case of single-batch acceleration such an improvement appears to be possible by changing some details in the way the Booster and Main Ring rf systems are phase-locked together at the time of transfer.

Another similar experiment done during this period has to do with the momentum spread of beam bunches at transition during normal acceleration. This is a matter of interest at present because it may relate to the design of the Overpass lattice that is to carry Main Ring beam over the B0 detector facility. In this experiment we measured bunch lengths at two energies, 14 GeV and 19.7 GeV, below and above transition, at an average intensity

of 2.6×10^{10} protons per bunch (total Main Ring intensity 2.8×10^{13} protons per cycle). At these energies, the bunches are short enough to get good measurements and from these measurements and other information regarding the rf voltage and the acceleration rate, we were able to get numbers for the longitudinal emittance at the two energies. The results were 0.22 eV-sec at 14 GeV and 0.28 eV-sec at 19.7 GeV, indicating a slight increase in the region of transition. Bunch lengths were also measured at transition (17.6 GeV), where they become very narrow (about 2.5 nanoseconds). From the measured bunch length and assuming the longitudinal emittance is 0.25 eV-sec at transition, we can make an estimate of the momentum spread. Such estimates are somewhat model-dependent. If the phase-space (i.e., ΔE, Δt) distribution were an ellipse (which it is almost certainly not) the momentum spread would be $\Delta p/p = \pm 3.6\times10^{-3}$. Other distribution models give results as large as $\pm 4.2\times10^{-3}$.[2]

The installation of extraction equipment at E0 for Tevatron injection may have affected the momentum aperture in a way that is not consistent with our need to make very narrow bunches at 125 GeV. Consequently, after the installation and successful operation of that equipment, we made horizontal momentum-aperture measurements with single booster batches using the 'ad hoc' low-level system at 8 GeV and at 125 GeV. These measurements were done by accelerating and decelerating the beam at constant field so that the beam moves inward and outward until either 10 percent or 50 percent of the beam was lost. The result of these measurements are tabulated below.

Energy (GeV)	Aperature, $\Delta p/p$ (90% transm.)	Aperature, $\Delta p/p$ (50% transm.)
8	$\pm 3\times10^{-3}$	$\pm 4.8\times10^{-3}$
125	$\pm 2.7\times10^{-3}$	$\pm 3.2\times10^{-3}$

The beam bunches used as probes in these measurements have themselves a momentum spread of about $\pm 10^{-3}$ so the true single-particle momentum apertures are slightly larger than those listed. In any case the useful aperture at 125 GeV is shown to be adequate for the beam manipulations proposed.

After completion of these preliminary experiments, we set up the ad-hoc single-batch system and added components to allow good transient beam-loading compensation during injection and acceleration. We then asked the Control Room Operations Crew to tune the accelerator for maximum single-batch intensity. Within a few hours, the intensity exceeded 2×10^{12} protons per cycle so we are confident that the system works adequately well, and it will be able to approach our desired antiproton production intensity of 2.5×10^{13} protons per cycle. (This is equivalent to 3.25×10^{13} protons per cycle for a full ring, the record intensity recently achieved.)

At this point, the way was clear for an attempt at the gymnastics necessary for generating the required narrow bunches at 125 GeV. A few additional experiments and results of older experiments all indicated that the longitudinal emittance of intense bunches at 125 GeV will be about 0.3 eV-sec. If the rf voltage is raised, the height of the bucket shown in Fig. 1a increases as the square root of the voltage. If this is done slowly with respect to the period of rotation of protons on their orbits within the bucket, (the synchrotron phase-oscillation period), then the shape of the occupied ellipse will adjust itself to the boundary shape. Since the area remains constant, increasing the height reduces the length. Raising the Main Ring rf voltage to 4 megavolts, its maximum value, at 125 GeV results in a bunch length of 2.7 nanoseconds for a 0.3 eV-sec bunch. This is not short enough for our purposes, so we must be a little more clever.

The first step is to lower the voltage slowly down to about 20kV so that the bunch gets very long within the bucket, as shown in Fig. 1b. We want the bunch length at this point to be one half the bucket length, or about 9.4 nanoseconds. Figure 2 shows a series of bunch-length pictures with time progressing downward during this lengthening period. The bunch length at the bottom of the picture is about the required length. At this point, the rf voltage is suddenly raised to its maximum value by quickly switching the cavity excitation phases to the correct value. The elongated bunch now finds itself in a much larger bucket and the shape of the bunch is badly mismatched to the bucket shape. Protons at the extreme ends of the bunch will now travel on orbits that **are** matched to the bucket shape and they will proceed to points in the bucket that are $1/\sqrt{2}$ times the maximum bucket height (or energy). Other protons in the distribution will move similarly, so the entire distribution will rotate to a vertical configuration as shown. Because the **area** of the distribution remains constant, the waist becomes very thin at this point and we have our narrow bunches. This quarter-turn process requires about 1.3 milliseconds and the beam must be extracted precisely when the bunches pass through their narrowest state. If the beam is not extracted at that time, the rotation will, of course, continue and the bunches will become successively broad and narrow again. This rotation is not perfectly linear. Particles at the extreme ends of the distribution become distorted as time progresses. Because of this, nothing is gained by making the initial distribution larger than one-half of the bucket length. Figure 3 shows a series of bunch traces covering one-half of a rotation period. The bunches clearly behave as predicted. In the case shown the maximum voltage was 1 MV instead of the required 4 MV, so the bunches do not become as narrow as is required. In Fig. 4 we show a few traces just at the narrowest part of the evolution. The voltage has been raised to 3.6 MV and a bunch pickup with improved bandwidth was used. We see that the bunches at the narrowest point are about 1 nanosecond full width.

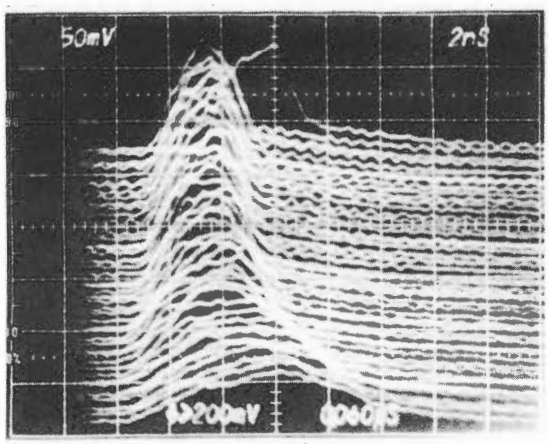


Figure 2.
Bunch broadening resulting from slow reduction in rf voltage. Time progresses downward and total debunching time is 100 msec. Final bunch length is near 9 nsec.

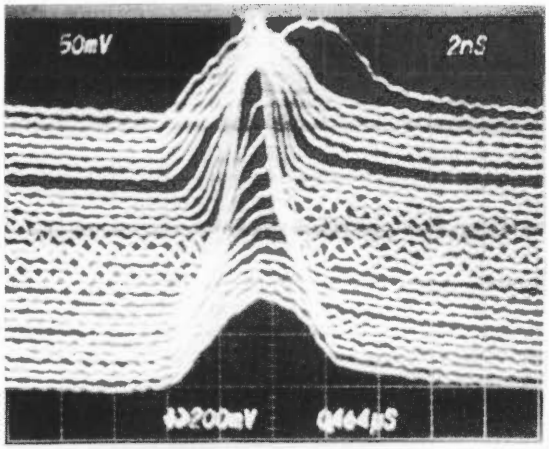


Figure 3.

Rotation of mismatched bunch following sudden increase in rf voltage to 1 MV. Time progresses downward and traces are separated by about 100 msec. The displaced top trace is a mistrigger.

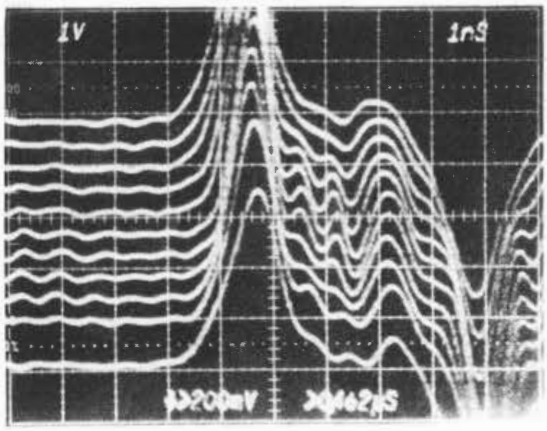


Figure 4.

Bunch length pictures near the narrowest bunch time. Traces are separated by one machine turn, 20.9 μsec. The narrowest bunch has length about 1 nsec. The beam pickup is a broadband transmission line pickup so inverted reflections from the downstream end of the pickup also appear.

The process of reducing the momentum spread of the antiprotons produced by these bunches will be the exact opposite of the narrowing process shown here. The narrow antiproton bunches will be injected into a 'Debuncher' ring where they will be centered in rf buckets of appropriate size, so that the mismatched distribution will appear just as Fig. 1c. The antiproton distributions will rotate to the low-momentum horizontal position, at which time the rf voltage and bucket height will suddenly be reduced to match the distribution as in Fig. 1b. The rf voltage will then be slowly lowered even further until the distribution is as flat as possible.

After a sufficient quantity of antiprotons has been produced, accumulated and cooled, we will accelerate quantities of about 10^{11} antiprotons per cycle in the Main Ring to 150 GeV for injection into the Tevatron. We expect to accelerate these particles in ensembles of about 8 adjacent bunches. This will be another task for the modified low-level rf system. During the Energy Saver extraction studies mentioned above, the number of bunches and the intensity per bunch were reduced to the minimum practicable value by mistiming various kickers. Batches of twenty adjacent bunches with a total intensity of about 4×10^{9} protons were successfully accelerated with no apparent problems.[3] This is probably the lowest beam intensity ever accelerated in the Main Ring, so the accelerator has made the unique achievement of two records, the largest and the smallest beam intensities achieved, within one week. This result indicates that the system is very nearly adequate for the required antiproton acceleration.

There are still many tests to be completed, but the results of this most recent study period have gone a long way toward demonstrating that the varied accelerator operational modes required for the Tevatron I project are relatively easily accomplished and no serious barriers to achieving our goals have yet been encountered.

References

1. J. E. Griffin, J. A. MacLachlan, and J. F. Bridges, **Review of the Fermilab Main Ring Accelerator Study Program As Directed to the $\bar{p}p$ Program**, IEEE Trans. Nucl. Sci. **NS-28**, 2040, June 1981.

2. S. Ohnuma, Private Communications, and various extant reports regarding momentum distribution at transition.

3. These operations were done by M. Harrison, J. Lackey, and others in the EO injection group.

INFORMATION REGARDING DO PROPOSALS

Proposals for the DO $\bar{p}p$ interaction region are due on February 1, 1983 in accordance with the recommendation of the Fermilab PAC. (See Fermilab Report - June 1982). It would be very helpful to both the PAC and Fermilab if we could have a letter-of-intent by November 1, 1982 from experimenters preparing proposals. The letter should describe with reasonable completeness the objective of the experiment and the proposed apparatus. In response to discussion with the PAC we will entertain proposals which are intended for an experimental hall of volume on the order of $750m^3$. This is approximately 50% larger than originally proposed. Within limits, the detailed shape of the hall will depend on the proposal(s) finally accepted.

The detector(s) intended for DO will need to be able to be removed easily. Fermilab will attempt, if necessary, to provide limited assistance ($< \$1M$) for the construction of the detector.

The present schedule would allow the first run in FY'86 and we would hope to be able to have a complete detector assembled in DO by that time.

Presently, in addition to CDF, there are two $\bar{p}p$ experiments with Stage One approval, E-710 (total and elastic cross sections) and E-713 (particle search with a lexon detector). The PAC has suggested that these might be run in an interaction region other than DO. The PAC still has under consideration two proposals, P-714 (a large Pb glass array) and P-719, (ep) for the DO area.

We repeat that the deadline for a useful letter of intent is November 1, 1982. We are planning a workshop to discuss the physics opportunities in DO for November 19-20, 1982. Details of the workshop will be announced shortly.

Any questions should be directed to the Program Planning Office.

SUMMARY OF OPERATIONS - APRIL - MAY - JUNE 1982

Howard Fenker, Program Planning Office

Eighteen experiments took data during these three months, accumulating a total of 8,750 hours and 929 K bubble chamber pictures for high energy physics research and detector calibration. Eleven experiments completed data taking. Originally, only six hours of running were scheduled for June, but this was increased to two weeks after the power company agreed to a variance in the procedure for calculating the Laboratory's power demand charge.

The Accelerator Division met some rather challenging demands during this period. In addition to the usual 1-sec slow spill and 1-msec fast spill at 400 GeV/c, the Main Ring produced 10^{12} protons in a 1-msec spill at 250 GeV/c, low-intensity pings (six short bursts spaced over the 1-sec slow extraction time), and high-intensity pings. For a large part of the time, all these modes were in operation simultaneously. No less challenging for the operators, however, was turning each individual mode on and off as experimental requirements varied.

On May 3, the accelerating column for the main Cockcroft-Walton broke down because of a vacuum leak in a cracked ceramic insulator. To repair this, the column had to be removed, dismantled, cleaned, reassembled with a new insulator, and put back in place--all without disturbing the pre-linac beam line or back-up preaccelerator. This task was successfully accomplished by May 24. After the column was put back into service, another 400 GeV/c intensity record was set: 3.253×10^{13} protons in a pulse. When the 400 GeV/c era ended on June 14, the accelerator had delivered beam for 94% of the scheduled 112 hours during the previous week.

During the week following the end of HEP, accelerator studies were carried out in preparation for the Tevatron. In particular, a milestone was reached on June 14 when 150 GeV/c beam was transported out of the Main Ring and through the Saver injection line.

FERMI NATIONAL ACCELERATOR LABORATORY
MONTHLY OPERATIONS HISTORY
APRIL 1982

DATE	ACCELERATOR	PROTON AREA	NEUTRINO AREA	MESON AREA
Thu. 4/1	Accelerator Maintenance & Development			
Fri. 4/2	~~Improve F1 Vacuum~~	326 (PW)	701/594 (N0)	609 (M6)
Sat. 4/3	~~F-Sector Security Broken~~	612 (PE)	597 (N7)	613 (M2)
Sun. 4/4	~~Main Ring Power~~	OFF (PC)	673 (N1)	617 (M3)
Mon. 4/5				605 (M1)
Tue. 4/6	Power Failure			CDF (M4)
Wed. 4/7	~~Linac Station 7~~			Cryogenic Systems Recovery from Power Failure
Thu. 4/8	~2.5x10^{13}ppp			
Fri. 4/9	Accelerator Necessary Repairs			
Sat. 4/10	~2.8x10^{13}ppp	326 (PW)	701/594 (N0)	609 (M6)
Sun. 4/11	@400 GeV/c	612 (PE)	597 (N7)	613 (M2)
Mon. 4/12		619 (PC)	673 (N1)	617 (M3)
Tue. 4/13	~~PSEP Shorted~~			605 (M1)
Wed. 4/14		End 612		CDF (M4)
Thu. 4/15		400 (PE)		
Fri. 4/16	~~M.R. Safety System~~			
Sat. 4/17	~2.5x10^{13}ppp	400 (PE)		
Sun. 4/18	@400 GeV/c	619 (PC)		
Mon. 4/19		326/615 (PW)		
Tue. 4/20	Accelerator Studies		End 673	
Wed. 4/21	Accelerator Maintenance & Development			
Thu. 4/22	~~Left Bends, Booster~~	400 (PE)	701/594 (N0)	609 (M6)
Fri. 4/23	~2.2x10^{13}ppp	619 (PC)	597 (N7)	613 (M2)
Sat. 4/24		326/615 (PW)		605 (M1)
Sun. 4/25	~~Main Ring Controls~~			617 (M3)
Mon. 4/26		End 326		660 (M4)
Tue. 4/27	Accelerator Necessary Repairs			
Wed. 4/28	~2.5x10^{13}ppp	400 (PE)	701/594 (N0)	609 (M6)
Thu. 4/29	@400 GeV/c	619 (PC)	597 (N7)	613 (M2)
Fri. 4/30		615 (PW)		605 (M1)
	Accelerator Necessary Repairs			617 (M3)
	~2.7x10^{13}ppp	400 (PE)	701/594 (N0)	660 (M4)
	@400 GeV/c	619 (PC)	597 (N7)	609 (M6)
		615 (PW)		613 (M2)
	~~M.R. Ground Fault~~			605 (M1)
	~1.2x10^{13}ppp			617 (M3)
	@400 GeV/c			660 (M4)
	200 GeV/c Front Porch			
	Accelerator Studies & Necessary Repairs			
	~2.2x10^{13}ppp	400 (PE)	701/594 (N0)	609 (M6)
	@400 GeV/c	619 (PC)	597 (N7)	613 (M2)
		615 (PW)		605 (M1)
				617 (M3)
				660 (M4)

FERMI NATIONAL ACCELERATOR LABORATORY
MONTHLY OPERATIONS HISTORY
MAY 1982

DATE	ACCELERATOR	PROTON AREA	NEUTRINO AREA	MESON AREA
Sat. 5/1	Ion Source Problems	400 (PE) 619 (PC) 615 (PW)	701/594 (N0) 597 (N7) End 597	609 (M6), 613 (M2) 605 (M1), 617 (M3) 660 (M4) End 660
Sun. 5/2	~1.9×10^{13}ppp			
Mon. 5/3	Controls & Pwr Supply	Accelerator Necessary Repairs		
Tue. 5/4		400, 619, 615	701/594, 565/570	609,613,605,617,CDF
Wed. 5/5		Accelerator Maintenance & Development		
Thu. 5/6	~2.2×10^{13}ppp 1 sec flattop @400 GeV/c 250 GeV/c Front Porch	400 (PE) 619 (PC) 615 (PW)	701/594 (N0) 565/570 (N7)	609 (M6) 613 (M2) 605 (M1) 617 (M3) CDF (M4)
Fri. 5/7				
Sat. 5/8				
Sun. 5/9				
Mon. 5/10				
Tue. 5/11				End 609
Wed. 5/12				End 613
Thu. 5/13		Accelerator Studies & Maintenance		
Fri. 5/14	Replace Bad Source ~2.0×10^{13}ppp	400 (PE) 619 (PC) 615 (PW)	701/594 (N0) 565/570 (N7)	617 (M3) 605 (M1) 623 (M6) CDF (M4) OFF (M2)
Sat. 5/15	Power Glitch Recovery			
Sun. 5/16	Power Glitch Recovery			
Mon. 5/17				
Tue. 5/18		Accelerator Studies		
Wed. 5/19		Accelerator Maintenance & Development		
Thu. 5/20	~1.8×10^{13}ppp 1 sec flattop @400 GeV/c 250 GeV/c Front Porch	400 (PE) 619 (PC) 615 (PW)	701/594 (N0) 565/570 (N7)	617 (M3) 623 (M6) 605 (M1) CDF (M4) OFF (M2)
Fri. 5/21				
Sat. 5/22	Linac R.F. Station 7			
Sun. 5/23	~2.3×10^{13}ppp @400 GeV/c 250 GeV/c Front Porch			
Mon. 5/24				
Tue. 5/25				
Wed. 5/26				
Thu. 5/27		Accelerator Maintenance & Development, Studies		
Fri. 5/28	~2.6×10^{13}ppp	619 (PC) 400 (PE) 615 (PW)	701/594 (N0) 565/570 (N7)	617 (M3) 623 (M6) 605 (M1) CDF (M4) OFF (M2)
Sat. 5/29	Injection Kicker Down			
Sun. 5/30	NEW INTENSITY RECORD 3.253×10^{13} Protons			
Mon. 5/31	~2.5×10^{13}ppp		End 565/570	

FERMI NATIONAL ACCELERATOR LABORATORY
MONTHLY OPERATIONS HISTORY
JUNE 1982

DATE	ACCELERATOR	PROTON AREA	NEUTRINO AREA	MESON AREA
Tue. 6/1	Accelerator Maintenance & Development			
Wed. 6/2	~1.4×10^{13} ppp 250 GeV/c Front Porch 400 GeV/c Flattop	619 (PC) 400 (PE) 615 (PW)	701 (NO) 594 (NO)	617 (M3) 623 (M6) 605 (M1) CDF (M4) OFF (M2)
Thu. 6/3				
Fri. 6/4	~~Necessary Repairs~~			
Sat. 6/5	~2.6×10^{13} ppp 250 GeV/c Front Porch 400 GeV/c Flattop			
Sun. 6/6				
Mon. 6/7	Accelerator Studies			
Tue. 6/8				
Wed. 6/9	~2.8×10^{13} ppp 1.0 sec flattop @400 GeV/c 250 GeV/c Front Porch	619 (PC) 400 (PE) 615 (PW)	701 (NO) 594 (NO)	617 (M3) 623 (M6) 605 (M1) CDF/660 (M4) OFF (M2)
Thu. 6/10				
Fri. 6/11				
Sat. 6/12				
Sun. 6/13	~~F5 38 shorted~~			
Mon. 6/14	Accelerator Maintenance & Development			
Tue. 6/15	Accelerator Studies			
Wed. 6/16				
Thu. 6/17	- Accelerator Shutdown -			
Fri. 6/18				
Sat. 6/19				
Sun. 6/20				
Mon. 6/21				
Tue. 6/22				
Wed. 6/23				
Thu. 6/24				
Fri. 6/25				
Sat. 6/26				
Sun. 6/27				
Mon. 6/28				
Tue. 6/29				
Wed. 6/30				

BEAM UTILIZATION BY

	Beam	Hours
Dimuon #326	PW	200
Particle Search #400	PE	750
Photon Dissociation #612	PE	160
Forward Search #615	PW	580
Transition Moment #619	PC	680
30-in. Hybrid #565/570	N7	-
Neutrino #594	N0	900
30-in. Hybrid #597	N7	-
Chi Meson #673	N1	140
Neutrino Oscillations #701	N0	1060
High Mass Pairs #605	M1	880
Hadron Jets #609	M6	450
Beam Dump #613	M2	570
CP Violation #617	M3	1040
Particle Search #623	M6	360
Channeling #660	M4	270
CDF Development	M4	710
TOTAL HOURS FOR HIGH ENERGY PHYSICS		8750

EXPERIMENTAL ACTIVITY - APRIL, MAY, and JUNE 1982

Activities
data taking at high intensity; run completed
setup, trigger, and buffer memory development; data
TREAD time projection chamber data; run finished
setup and tests; data
setup, calibration, and data; completed
429K pictures; completed
neutrino elastic scattering data; detector; calibration completed
500K pictures; completed
data; completion of run
data and calibration; run completed
setup; low intensity testing
calibration of multiple energies; data
high intensity running; experiment completed
neutral and charged data
setup and data collection; run finished
data taking completed
prototype drift chamber and calorimeter tests

FACILITY UTILIZATION SUMMARY - APRIL 1982

I. Summary of Accelerator Operations

		Hours	
A. Accelerator use for physics research			
High energy physics research		518.3	
Accelerator physics research		12.9	
	Subtotal		531.2
B. Other Activities			
Program interruption		61.7	
Accelerator setup and tuning to experimental areas		-	
	Subtotal		61.7
C. Unscheduled interruption		126.1	
D. Unmanned time		-	
Total			719.0

II. Summaries of High Energy Physics Research Use

	# of Expts.	Hours	Results
A. Counter experiments	12	3180	3 exp. completed
B. Bubble chamber experiments	1	-	465K pictures
C. Emulsion experiments			
D. Special target experiments	1	-	5 targets exposed
E. Test experiments			
F. Engineering studies and tests	1	160	
G. Other Beam Use			
Totals	15	3340	

III. Number of Protons Accelerated and Delivered ($\times 10^{17}$)

A. Beam accelerated in Main Ring		31.0
B. Beam delivered to experimental areas		28.0
Proton Area		3.8
Neutrino Area		
	Slow Spill	2.4
	Fast Spill	14.0
Meson Area		7.4

FACILITY UTILIZATION SUMMARY - MAY 1982

I. Summary of Accelerator Operations

		Hours	
A. Accelerator use for physics research			
High energy physics research		555.6	
Accelerator physics research		21.5	
	Subtotal		577.1
B. Other Activities			
Program interruption		52.9	
Accelerator setup and tuning to experimental areas		-	
	Subtotal		52.9
C. Unscheduled interruption		114.0	
D. Unmanned time		-	
Total			744.0

II. Summaries of High Energy Physics Research Use

	# of Expts.	Hours	Results
A. Counter experiments	11	3475	2 exp. completed
B. Bubble chamber experiments	2		460K pictures
C. Emulsion experiments			
D. Special target experiments	1	-	4 targets exposed
E. Test experiments			
F. Engineering studies and tests	1	410	
G. Other Beam Use			
Totals	15	3885	

III. Number of Protons Accelerated and Delivered ($\times 10^{17}$)

A. Beam accelerated in Main Ring		29.4
B. Beam delivered to experimental areas		25.2
Proton Area		0.7
Neutrino Area		
	Slow Spill	7.2
	Fast Spill	8.9
Meson Area		8.4

FACILITY UTILIZATION SUMMARY - JUNE 1982

I. Summary of Accelerator Operations

		Hours	
A. Accelerator use for physics research			
High energy physics research		217.9	
Accelerator physics research		89.8	
	Subtotal		307.7
B. Other Activities			
Program interruption		38.0	
Accelerator setup and tuning to experimental areas		-	
	Subtotal		38.0
C. Unscheduled interruption		38.3	
D. Unmanned time		336.0	
Total			720.0

II. Summaries of High Energy Physics Research Use

	# of Expts.	Hours	Results
A. Counter experiments	9	1385	6 exp. completed
B. Bubble chamber experiments	1	-	5K pictures
C. Emulsion experiments			
D. Special target experiments	1	-	2 targets exposed
E. Test experiments			
F. Engineering studies and tests	1	150	
G. Other Beam Use			
Totals	12	1535	

III. Number of Protons Accelerated and Delivered ($\times 10^{17}$)

A. Beam accelerated in Main Ring		12.5
B. Beam delivered to experimental areas		11.2
Proton Area		1.0
Neutrino Area		
	Slow Spill	2.2
	Fast Spill	4.3
Meson Area		3.7

SITUATION REPORT - JULY, 1982

PAGE 1 FERMI NATIONAL ACCELERATOR LABORATORY PROGRAM PLANNING OFFICE
20 JUL 1982

EXPERIMENTAL PROGRAM SITUATION REPORT

THE EXPERIMENTAL PROGRAM SITUATION AT FERMILAB IS SUMMARIZED BELOW. THE EXPERIMENTS ARE LISTED BY EXPERIMENTAL AREA AND BEAMLINE UNDER CATEGORIES THAT BEST DESCRIBE THEIR STATUS ON JULY 1, 1982. FOR EXPERIMENTS WHICH HAVE BEEN COMPLETED OR HAVE RECEIVED BEAM, THE AMOUNT OF RUNNING TIME OF EXPOSURE TO DATE IS LISTED. THE EXPERIMENTAL AREA NAMES ARE ABBREVIATED AS FOLLOWS: MESON AREA (MA), NEUTRINO AREA (NA), PROTON AREA (PA), INTERNAL TARGET AREA (ITA), AND COLLISION AREA (COL). PROPOSALS OR EXPERIMENTS THAT ARE REQUESTING TEVATRON ENERGY ARE PRECEDED BY TEV.

TOTAL NUMBER OF APPROVED EXPERIMENTS - 327

AREA-BEAM		SPOKESPERSON	TOTAL RUN	DATE COMPLETED
A. EXPERIMENTS THAT HAVE COMPLETED DATA TAKING (295):				
(ONLY EXPERIMENTS COMPLETED SINCE 01 JAN 1982 ARE LISTED BELOW				
MA-M1	PARTICLE SEARCH #515	ROSEN	2,650 HOURS	10 MAR 1982
-M2	NEUTRAL HYPERON #555	DEVLIN	650 HOURS	17 FEB 1982
	BEAM DUMP #613	BOE	1,800 HOURS	13 MAY 1982
-M4	CHANNELING #660	GIBSON	425 HOURS	13 JUN 1982
-M6	PARTICLE SEARCH #623	GREEN	425 HOURS	14 JUN 1982
NA-N0-DICHROM	NEUTRINO #594	WALKER	4,400 HOURS	14 JUN 1982
	NEUTRINO OSCILLATION #701	SHAEVITZ	2,250 HOURS	14 JUN 1982
-MUON/HADRON	CHI MESON #673	COOPER	1,100 HOURS	14 APR 1982
-30 INCH	30-INCH HYBRID #565	PLESS	1,068K PIX	1 JUN 1982
	30-INCH HYBRID #570	PLESS	1,068K PIX	1 JUN 1982
	30-INCH HYBRID #597	WHITMORE	658K PIX	3 MAY 1982
PA-PE	PHOTON DISSOCIATION #612	GOULIANOS	1,850 HOURS	12 APR 1982
-PC	TRANSITION MAGNETIC MOMENT #619	DEVLIN	675 HOURS	14 JUN 1982
	CHARM PARTICLE #630	SANDWEISS	1,150 HOURS	15 MAR 1982
-PW	DI-MUON #326	SHOCHET	2,000 HOURS	26 APR 1982
	DI-MUON #537	COX	2,700 HOURS	28 FEB 1982

B. EXPERIMENTS THAT ARE IN PROGRESS (7):			TOTAL RUN TO DATE	DATE OF RECENT RUN
MA-M3	CP VIOLATION #617	WINSTEIN	2,300 HOURS	1 JUL 1982
-M6	HADRON JETS #557	ZIEMINSKI	600 HOURS	1 JUN 1981
	HADRON JETS #609	SELOVE	775 HOURS	1 JUL 1982
NA-N0-HOEN	15-FOOT ANTI-NEUTRINO/H2&NE#180	ERMOLOV	273K PIX	1 JUN 1977
-CTHEE	NUCLEAR FRAGMENTS #466	SUGARMAN	77 TARGETS EXPOSED	1 JUL 1982
PA-PE	PARTICLE SEARCH #400	BUTLER	1,000 HOURS	1 JUL 1982
-PW	FORWARD SEARCH #615	MCDONALD	580 HOURS	1 JUL 1982

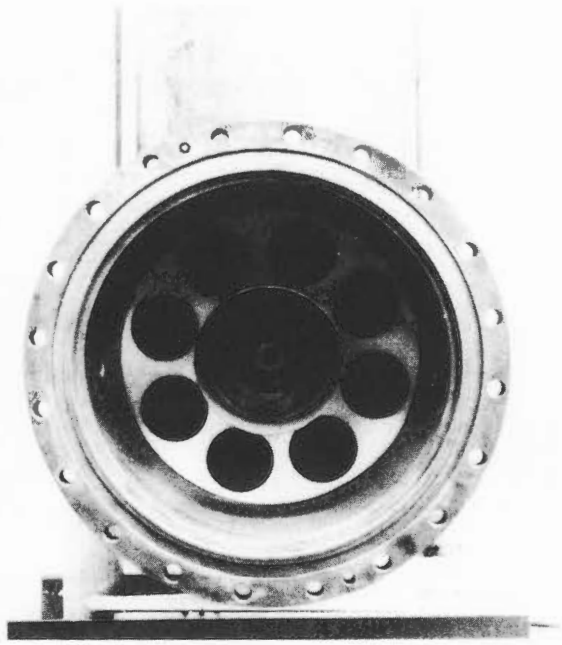
C. EXPERIMENTS THAT ARE IN TEST STAGE (1):			TOTAL RUN TO DATE	DATE OF RECENT RUN
MA-M1	HIGH MASS PAIRS #605	BROWN	900 HOURS	1 JUL 1982

F. OTHER APPROVED EXPERIMENTS (21):			APPROVAL
NA-OTHER	EMULSION/PROTONS @ 500 #508	WOLTER	EMULSION EXPOSURE
	EMULSION/PROTONS @ 500 #524	WILKES	EMULSION EXPOSURE
	EMULSION/PROTONS @ 500 #576	HEDERT	3 STACKS
PA-PC	SIGMA BETA DECAY #715	COOPER	UNSPECIFIED
TEV- MA-POL BEAM	POLARIZED BEAM #704	TOKOSAWA	UNSPECIFIED
- MA-M6	HADRON JET #672	DZIERBA	UNSPECIFIED
	DIRECT PHOTON #706	SLATTERY	UNSPECIFIED
TEV- NA-NEUTRINO	15-FT NEUTRINO/H2 & NE #632	MORRISON	UNSPECIFIED
	NEUTRINO #649	TAYLOR	UNSPECIFIED
	NEUTRINO #652	SCIULLI	UNSPECIFIED
- NA-BM DUMP	BEAM DUMP #636	PLESS	UNSPECIFIED
	15-FT BEAM DUMP #646	BALTAY	UNSPECIFIED
- NA-MUON	MUON #640	LOKEN	1,000 HOURS
	TEVATRON MUON #665	KIRK	UNSPECIFIED
- NA-N3	PARTICLE SEARCH #653	REAY	UNSPECIFIED
	PARTICLE SEARCH #690	KNAPP	UNSPECIFIED
TEV- PA-PE	PHOTOPRODUCTION #687	BUTLER	UNSPECIFIED
- PA-PC	CP VIOLATION #621	THOMSON	UNSPECIFIED
- PA-PW	CHI MESON #705	COX	UNSPECIFIED
TEV-COL-D 0	TOTAL CROSS-SECTION #710	RUBINSTEIN	UNSPECIFIED
	HIGHLY IONIZING PARTICLES #713	PRICE	UNSPECIFIED

PENDING PROPOSALS (22):			REQUEST
ITA-C 0	PARTICLE SEARCH #702	GLASS	400 HOURS
TEV- MA-POL BEAM	POLARIZED BEAM #682	UNDERWOOD	1,700 HOURS
	POLARIZED BEAM #688	DITZLER	400 HOURS
	POLARIZED BEAM #699	STANEK	1,000 HOURS
- MA-M6	PARTICLE SEARCH #684	LAI	1,000 HOURS
	PARTICLE SEARCH #696	TROWER	UNSPECIFIED
TEV- NA-NEUTRINO	NEUTRINO #635	MO	UNSPECIFIED
	HYBRID NEUTRINO #647	PETERSON	UNSPECIFIED
	15-FT NEUTRINO/D2 #651	MILLER	100K PIX
- NA-BM DUMP	BEAM DUMP #656	WHITAKER	UNSPECIFIED
	NEUTRINO OSCILLATION #700	MILLER	UNSPECIFIED
TEV- PA-PE	PHOTON DISSOCIATION #670	GOULIANOS	UNSPECIFIED
	PHOTOPRODUCTION OF JETS #683	CORNELL	1,500 HOURS

PAGE 2 EXPERIMENTAL PROGRAM SITUATION REPORT (CONT'D) 20 JUL 1982

AREA-BEAM		SPOKESPERSON	REQUEST
PENDING PROPOSALS(CONT'D)			
	TAGGED PHOTON #691	NASH	1,000 HOURS
- PA-PW	DI-MUON #671	POPE	UNSPECIFIED
	LEPTON PAIR #693	MCDONALD	1,000 HOURS
TEV-ITA-C 0	PROTON-PROTON SCATTERING #500B	FRANZINI	1,000 HOURS
	P-P AND P-D SCATTERING #681	GUTAY	950 HOURS
TEV-COL-D 0	LARGE ANGLE PARTICLE #714	GRANNIS	UNSPECIFIED
	ELECTRON TARGET FACILITY #719	LEE	UNSPECIFIED
TEV-UNSPEC BEAM	EMULSION/PI- @ 500 #667	WOLTER	EMULSION EXPOSURE
	EMULSION/PI- @ 800 #668	WOLTER	EMULSION EXPOSURE
	PARTICLE SEARCH #692	RUCHTI	1,000 HOURS



An Energy Saver accelerating cavity.
(Photograph by Fermilab Photo Unit)

MANUSCRIPTS, NOTES, LECTURES, AND COLLOQUIA PREPARED OR PRESENTED FROM JUNE 20, 1982 TO JULY 20, 1982

Copies of preprints with Fermilab publication numbers can be obtained from the Publications Office or Theoretical Physics Department, 3rd floor east, Central Laboratory. Copies of some articles listed are on the reference shelf in the Fermilab Library.

Experimental Physics

M. Binkley et al. Experiment #537	J/ψ Resonance Production in 125 GeV/c $\bar{p}N$ and π^-N Interactions (FERMILAB-Conf-82/49-EXP; presented at the XXI International Conference on High Energy Physics, Paris, France, July 26-31, 1982)
M. Binkley et al. Experiment #537	Production of Muon Pairs with Masses Greater Than 4 GeV/c^2 in $\bar{p}N$ and π^-N Interactions at 125 GeV/c (FERMILAB-Conf-82/50-EXP; presented at the XXI International Conference on High Energy Physics, Paris, France, July 26-31, 1982)
B. Brown et al Experiment #557	Production of High Transverse Energy Events in pp Collisions at 400 GeV/c (FERMILAB-Pub-82/48-EXP; submitted to Phys. Rev. Lett.)
D. Edwards et al. Experiment #616	Recent Results on Charged Current and Neutral Current Cross Sections by the CFRR Collaboration (Talk presented at the European Physical Society Conference, Lisbon, July 1981)

Theoretical Physics

S. Dawson and C. T. Hill	Do Light Colored Scalars Exist? (FERMILAB-Pub-82/26-THY; submitted to Nucl. Phys. D.)
S. J. Brodskey and R. W. Brown	Zeros in Amplitudes: Gauge Theory and Radiation Interference (FERMILAB-Pub-82/35-THY; submitted to Phys. Rev.)

A. Buras	Composite Models Without Specators (FERMILAB-Pub-82/38-THY; submitted to Phys. Rev. D.)
K. Bitar et al.	Phase Structure and Renormalization Trajectories of Lattice SU(2) Gauge Theory (FERMILAB-Pub-82/39-THY; submitted to Phys. Rev. D.)

General

R. A. Carrigan et al.	Radiation from the Channeling of 10-GeV Positrons by Silicon Single Crystals (Published in Phys. Rev. Lett., February 1982)
C. Hojvat and A. Van Ginneken	Calculation of Antiproton Yields for the Fermilab Antiproton Source (Submitted to Nucl. Inst. Meth.)

Physics Notes

D. Neuffer et al.	Simulations of the Beam-Beam Interaction with Transient or Stationary Beam Displacement (FN-358)
M. Atac et al.	Saturated Avalanche Calorimeter (FN-368)
A. D. Russell	Orbit Tracking Studies for the Tevatron (FN-369)
L. Cohen	Absence of a Demonstrable Gain Factor for Neutron Beam Therapy of Epidermoid Carcinoma of the Head and Neck (FN-370)

Colloquia, Lectures, and Seminars

R. A. Carrigan	"Particles and Particle Properties" (Fermilab, June 21, 1982)
W. Fowler	"Report of the 9th International Cryogenic Engineering Conference in Kobe, Japan, May 11-14" (Fermilab, June 22, 1982)
C. Hill	"Theoretical Physics Overview" (Fermilab, June 24, 1982)

C.Kerns	"Phototubes and Fast Pulse Techniques" (Fermilab, June 28, 1982)
C. Zachos	"Supersymmetries" (Fermilab, June 29, 1982)
J. Griffin	"Tevatron I Beam Studies" (Fermilab, June 29, 1982)
J. Lach	"Hyperon Beams and Physics" (Fermilab, June 30, 1982)
P. MacKenzie	"Lattice Gauge Theory" (Fermilab, July 1, 1982)
J. Butler	"Scattering and Spectroscopy" (Fermilab, July 7, 1982)
A. Wehmann	"Acceptance Measurements for Saver Magnets" (Fermilab, July 9, 1982)
H. White	"Statistical Data Evaluation" (Fermilab, July 19, 1982)

ADVANCED COMPUTER R&D SEMINARS

A series of seminars and colloquia on research and development in advanced computers is being held at the Laboratory. Future scheduled talks in the series are:

Sept. 22	Jack Schwartz, New York University, "A Massively Parallel Network"
Oct. 7	Neil Lincoln, Control Data Corp., "The Cyber 205"
Nov. 11	David Kuck, Univ. of Illinois, "Compilers for Parallel Computers"
Nov. 18	William Sippach, Nevis Laboratory, "The Nevis Parallel Pipeline "Processor"

Future talks, as yet unscheduled, will include Ken Wallgreen, NASA, Burton Smith, Denelcor, and George Michael, Livermore. For further information, please refer to Tom Nash.

DATES TO REMEMBER

July 23, 1982	Deadline for requests for fall on-site housing. Responses will be mailed out by August 13, 1982. Starting dates for fall occupancy will begin the first week of September. For information, please call the Housing Office, Ext. 3777.
November 11-13, 1982	Physics Advisory Committee Meeting.
November 19-20, 1982	Workshop to discuss physics opportunities in D0.
February 1, 1983	Deadline for new D0 proposals and other submissions for consideration of the Physics Advisory Committee.