PS/Int. EA 60-13
26th September 1960

NOTES FROM BERKELEY.

K^- SEPARATED BEAM.

The double separator system which is producing the K^- beam of ~ 850 Mev/c is at present in 24 hr/day operation with the 15" HBC. In another 20 days the system will be adjusted for $\bar{p}$ to continue the run.

The beam intensity is monitored by a scintillation counter about 1/2" thick right against the bubble chamber with a lightguide some 3 feet long to allow the PM to be outside the magnetic field.

The film processing technique is such that the rolls of film return to the bubble chamber operators within 1 to 2 hrs of exposure, so that the chamber operation is monitored directly from the actual film.

An emulsion stack has been exposed in the "waste" K^-. Some 10^5 were obtained in about 2 weeks.

The separator system has a small stopping wedge to correct for momentum dispersion. This does not work as well as expected and the intensity gain is about balanced by the loss due to absorption and scattering. (Stop just before central bending magnet).

The separators have 200 kV negative and 250 kV positive on the plates. It is claimed that the limit is set by the high voltage sources. Stabilised to a few per mil.

The first tank was operating with a leak to give 1 1/2 micron and the second at 2 micron. Sometimes the tanks run for several hours without sparking. Then may spark frequently for some time.

The quadrupoles are current stabilised to about 1/2 o/o.

In the K^- run it is intended to study scattering, and in the $\bar{p}$ run the dynamics of the annihilation process in both hydrogen and deuterium.

Currently there appear to be only 3 or 4 experiments in progress. The K^- exposure above, a run with the 72" on a π^- of about 4 Gev/c to study associated production, and a run involving a filament chamber. The machine schedule is fixed. once per year, with a 15 o/o safety factor to be used at the discretion of the machine group leader. It is off two mornings per week. 24 hrs/day otherwise.

It seems there are two homopolar generators which are just ready for switch-on at Livermore. May be pulsed slowly.

The heavy ion linac is at present working 16 hours per day. It can work 24 hrs per day and will do so after the present building extension. A beam of 5 μa of C^{12} ions can be obtained.

A search for element 103 is in progress. Californium on a thin foil is bombarded, and the recoil products stopped in hydrogen and electrostatically precipitated onto a mylar ribbon. This ribbon passes five crystal counters and a search is made for daughter products.

ABBREVIATED PROGRAMME OF BEVATRON (SINCE FEB. 1960).

W. POWELL	:	- $\theta_1 - \theta_2$ mass difference, PBC, beam K^+ 700 Mev/c.
LOFGREN	:	- (K^-,p) and (K^-,n) total charge exchange and elastic scattering cross sections, counters, beam K^- unseparated 1 to 5 Gev/c.
SEGRE	:	- (π,π) scattering, counters, beam 1.7 Gev/c π.
W. POWELL	:	- Charge independence of K, PBC, beam K^+ 700 Mev/c.
ALVAREZ	:	- $\pi^{\pm}$ interaction with p and d. 72" HBC beam $\pi^{\pm}$ 0.9 to 1.6 Gev/c.
GLAZER	:	- Properties of K^o, Xe BC, beam 700 Mev/c K^+.
MEYER	:	- Elastic scattering (π^-,p) counters, beam π^- 550 - 925 Mev/c.
ALVAREZ	:	- (K^-,p) and $(K^-$ d) interactions, 15" HBC beam K^-, 700 Mev/c.
ALVAREZ	:	- $(\bar{p}, p)$ interactions 15" HBC beam $\bar{p}$.
THORNTON	:	- (K^-,p) total cross-section counters beam K^- 0.2 to 1.5 Gev/c, unseparated.

BLOCK : - (K^-, He) interactions ? beam K^- 700 Mev/c

LOFGREN : - (K^+ and $\pi^\pm$, p) interactions counters beam K^+ and $\pi^\pm$ 1 to 3 Gev/c unseparated.

LEVI SETTI, WILKINSON : Booked on K^- 700 Mev/c beam.

SEGRE : - (π,π) scattering counters π^- 1.7 Gev/c

LOFGREN : - Hyperon decay and Λ° magnetic moment. counters beam π^+ 1 Gev/c.

THORNTON : - K_{e3} and $K_{\mu 3}$ spectra counters beam K^+ 700 Mev/c unseparated.

MEYER : - Photon yield spectra - beam primary protons.

JONES-PERL : - Production of K pairs luminescent chamber beam π^- 1.4 to 1.5 Gev/c.

DISCUSSION WITH PROFESSOR WILSON POWELL.

The group is working on the leptonic decay of Λ°.

In case of polarisation of Λ° experiments we would be in a more favourable position because of higher energy of the p to look for scatters. Group is also studying fore-aft assymetry of Λ° decay.

Stressed value of δ rays in particle identification, particularly Λ°, θ°.

Stressed that we should have a space table working at same time as our P.B.C. (with full scale precision reprojection).

Group makes use of many visual aids. e.g., stopping particle clock, templates, δ ray spirals.

If we need it he would be very willing to measure our film until our own facilities available. They handle 1000 events per week.

One Frankenstein works 150 hrs per week. Two measuring microscopes work 80 hrs per week each. He thinks 1 microscope = 1/2 Frankenstein.

H.B.C. GROUP.

Experiments are proposed from group members and then discussed with Alvarez. Outside collaboration seems extensive, and is done independently, only very rare events returned to H.B.C. group e.g., leptonic decay of Λ^{o}.

Total group strength is about 120. Probably about 50 professional scientists and engineers. About 15 Ph D's doing physics. About 20 mechanical and electronic engineers engaged in data analysis. There are 48 scanners, including 9 full time "beam watchers". Most other scanners are students - and do about 4 to 5 hrs. Data analysis industry is in an advanced state of development. There are about 4 Frankensteins for 35 mm and one for the 72" chamber film. All film is clear base. Various templates are used when possible on scanning tables.

After about five passages through scanning projectors the film is heavily damaged.

A 25" H.B.C. is being designed and will be working one year from now. Horizontal bottom window. Top of chamber is condenser lens. Bellows expansion of whole chamber of about 1/16" will be achieved by means of resonant gas system.

Magnet will be 17 to 18 kG for 1 MW. Expansion time expected to be about 10 ms.

SCINTILLATION CHAMBER.

Arrangement of image intensifiers similar to that in Brookhaven, except for camera recording at last intensifier. First lens was f:5 looking at about 1 1/2 litres of NaI. (Costs about $ 2000 per litre). Picture are useful - would make good hodoscope.

Also saw fibre scintillator hodoscope - using bundle of fibres ($ 200 per litre from Pilot Chemicals) butting against 5" image intensifier and viewed with periscope about 1 metre long. Very useful for beam alignment. Precise to about 1" for the particular arrangement with stalk of fibres about 4" x 4".

SEPARATORS.

There have been sample lengths of a resitive cable which can be made with graded insulation. Bids have been called for 600 KV variety. Joe Murray will write to Claude about this. Idea is to have a dissipative cable to reduce transients.

The separators have mostly used oil pumps, trapped, but no experience without traps. No difficulties. Also have used mercury.

Formation of the electrodes takes a few hours. However total operating voltage is < 400 kV. If raise voltage on negative electrode of one of present separators spurious current is taken with sparks.

If more than 0.2 μ of H_2, He, N_2 or A is used there is an effect of spark suppression.

With the glass electrodes have held 450 kV total over 15 mm and 500 kV total from 20 to 50 mm. Mechanical forces set limit at lower gaps. True limit of the glass electrodes have not been determined. Same result with or without magnetic field.

Must always switch on HV first and then magnetic field. This is arranged automatically after each spark.

Have observed mysterious non reproducible effect of HV at higher magnetic fields. For example the separator had been running very well at about 450 KV. total. On reducing voltage to 380 KV and raising magnetic field by 20 o/o spark rate changed from once per 2 or 3 hours to one per minute. Cured by reducing pressure from 2 μ to 1 μ. Will do some systematic experiments soon on interaction between magnetic and electric field.

The glass plates are 27" long.

Will build for next spring some 20' tanks with glass electrodes to use 2 x 600 KV generators. Hope to have 120 KV/cm for K^- beam at 1.5 Gev/c.

Have thought of possibility of a dropping plate separator. Charge glass plates at narrow gap and then allow to fall freely to raise volume of field. Should be OK but mechanically difficult.

Joe Murray will write to Simon about magnetic slit. Have been thinking on possibility of using different types of optics - without images.

C.A. Ramm

/fv

Distribution : (closed)
PBC Group
Parameter Committee