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Status report on approved Omega experiments
and summary of new proposals with tentative schedule for 1974

J.D. Dowell
Omega Coordinator

Summary of status of Omega experiments

1. Slow n experiment S112

Study of neutral bosons with a neutron time of flight trigger.

$\pi^- p \rightarrow X^0 n$ at 12 GeV/c

Data taking complete. 3M triggers recorded. 1M good.

e.g. 60,000 $X^0 \rightarrow \pi^+ \pi^-$ ~ 250 ev/ μ b
70,000 $X^0 \rightarrow \pi^+ \pi^- \pi^0$

2. Slow p experiment S113

Systematic study of high mass boson resonances with high statistics and good resolution.

$\pi^- p \rightarrow X^- p$ at 12 GeV/c

Data taking complete. 3.3M triggers recorded. 2M good.

e.g. 200,000 $X^- \rightarrow \pi^- \pi^+ \pi^-$ ~ 300 ev/ μ b
150,000 $X^- \rightarrow \pi^- \pi^0$

3. Fast Λ experiment S114

Study of two-body, quasi two-body and inclusive process involving a fast Λ - including polarization.

Data taking complete.

$\pi^- p \rightarrow \Lambda^0 X^0$ at 8 GeV/c 1.0M triggers, 55,000 Λ s, few 1000 ev/ μ b
 $\pi^+ p \rightarrow \Lambda^0 X^{++}$ at 12 GeV/c 0.2M triggers, 1,500 Λ s, few 100 ev/ μ b

4. Fast $\bar{\Lambda}$ experiment S115

Study of high mass resonances decaying into $\bar{B}B$ or $\bar{B}BB$.

Half data taken, finish in April 1974.

$K^+ p \rightarrow (\bar{\Lambda}, \bar{p}, K^-) + \text{anything}$ at 12 GeV/c.

$\pi^+ p \rightarrow$ ditto

0.82M $K^+ p$ triggers recorded

0.2M $\pi^+ p$ triggers recorded

> 100 ev/ μ b (seen $\bar{\Lambda}$).

Expect 3,500 $\bar{\Lambda}$, 35,000 K^0 .

5. K* experiment S116

Study of non-diffractively produced K* s, $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$.

Expect $\sim 15,000$ good events ~ 250 ev/ μ b.

Require multiplicity in 2 MWPC. One tested with associated logic, second under construction. Ready to take data in summer 1974.

6. Fast p experiment S117

Study of baryon exchange.

$\pi^- (K^-, \bar{p}) p \rightarrow p + X$
 $\pi^+ (K^+) p \rightarrow p + X$ at 12 GeV/c

Cross sections < 1 μ b.

Full test carried out in December 1973; 0.2M triggers at $44/10^5 \pi^-$.

π^+ not yet tested. Should take data in May 1974.

Expect $\gtrsim 10^4$ ev/ μ b.

7. $\pi\pi$ experiment S133

$\pi\pi$ scattering lengths and phase shifts for $M_{\pi\pi} < 500$ MeV/c².

$\pi^\pm p \rightarrow \pi^+ \pi^\mp n$ at 3.2 GeV/c.

Partial test in June 1973 with vertical wires only in a MWPC.

Trigger rate encouraging at 8.2×10^{-4} . Should go down by a factor 3.

Expect 8,000 events in each channel for $M_{\pi\pi} < 500$ MeV/c².

Data taking runs (allocated by EEC)

June	1973	2½ days useful (PS troubles)	Λ
August	1973	Good run	n, $\bar{\Lambda}$, p
October	1973	Good run	Finished Λ (S114), p (S113)
December	1973	6 days lost due to Ω compressor	Finished n (S112)
March	1974	??	Finish $\bar{\Lambda}$ (S115), $\pi\pi$ (S133)

The runs included tests for
Fast p (S117) and K^* (S116)

Some very useful testing was done in ~ 7 days GGM
parasitic running.

Criteria for judging Omega experiments

Triggering

- | | | |
|---|---|---|
| a) Incident π^- | } | Give high sensitivity |
| b) Low cross section $\sim 100 \mu\text{b}$ | | $\gtrsim 10,000 \text{ ev}/\mu\text{b}$ |
| c) Large acceptance | | few 100 x bubble chamber |

but may be biased especially when triggering on decay products.

Other Omega features

i) Large acceptance for multipronged events

∴ one should look at 3 or more prongs since

e.g. CERN Munich can look at 2

but not too many because of multitrack efficiency and pattern recognition problems.

ii) Data ready digitized.

Even if the above triggering criteria are not satisfied one can record measured events in a very short time $\gtrsim 10$ x bubble chamber in 10 days.

iii) Resolution

2 x bubble chamber.

iv) Cerenkov identification

Qualitative advantage over bubble chamber. Also allows rapid selection of interesting events at the analysis stage.

Summary of New Omega Proposals

Experiment	Ev/μb	Biased ?	Omega features exploited	Physics	Other points	Time Request
$\pi^+ p \rightarrow X^+ n$ (PH I/COM-73/49)	100	No	Large multiprong acceptance	Complementary to slow n, p. Main interest $\pi^+ \pi^0, \pi^+ \pi^+$	Existing trigger. Can be fitted in without \checkmark .	10 days
Rare decays of mesons (PH I/COM-73/50)	3,000	Yes	Ditto + \checkmark	Essentially new information on $K\bar{K}\pi, \bar{p}\pi$ etc. Complementary to slow n,p 100 X bubble chamber		7 days
K^+ interaction trigger (PH I/COM-73/65)	250	No	Ditto + \checkmark	Provide needed improvement in knowledge of K^* s	Useful in anticipation of SPS RF beam. Good test of principle.	14 days
High P_T (Letter of Intent) (CERN/EEC-74/1)	10,000	Yes	Ditto + \checkmark	Exploratory	Topical. Anticipates higher energies.	10 days?

Tentative 1974 Omega schedule

<u>PS period</u>	<u>Dates</u>	<u>Nominal Length (x5/7)</u>	<u>Plan</u>
2	13/3 - 11/4	4½ weeks	{ Test double Č/Run $\pi^+(n)$?? Finish $\bar{\Lambda}$ (S115) Finish $\pi\pi$ (S133)
3	22/4 - 29/4	1 week (GGM)	{ Test fast p (S117) Test K^* (S116) Test drift chamber
4	29/5 - 22/6	3½ weeks	{ Run fast p, test K^* test new experiments/drift chamber.
5	1/7 - 8/7	1 week (GGM)	Test K^* /test new experiments
6	5/8 - 24/8	~ 3 weeks	Run K^* /test new experiments
8	2/10 - 26/10	3½ weeks	Run new experiment(s)
9	30/10 - 23/11	3½ weeks	Run new experiment(s)