

MACHINES AND AREAS COMMITTEE

Summary of meeting No 23 - March 7, 1973

Present : O. Barbalat (Secretary), D. Bloess, D. Dekkers, M. Georgijevic,
C. Germain, W. Hardt, H. Haseroth, L. Hoffmann, U. Jacob,
J.H.B. Madsen, G.L. Munday (Chairman), G. Plass, K.H. Reich,
F. Rohner, Ch. Rufer, P.H. Standley, Ch. Steinbach (part time)

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1. Continuous Transfer

It has already been formally agreed between MPS and Lab. II, that the PS beam will be modulated at 200 MHz, in order to allow easy observation by the SPS PU station system. It was agreed to allocate up to 1.5 m in s.s. 6 for this use.

The possibility has recently been mentioned that full RF trapping at 200 MHz in the PS rather than in the SPS might be desirable. This would require a much higher voltage level and therefore more space for 200 MHz cavities than for just beam modulation. An implication of performing the 10/200 MHz debunching-rebunching is the possible beam loss, which has to be dealt with somehow. The amount, estimated at a maximum of 20 %, must be investigated; dumping it outside both PS and SPS would of course be preferable.

2. Linac

Old Linac :

The work scheduled on the present Linac is :

- Cure the trouble which occurred on the tank I compensation amplifier,*

* The phase transient on tank 1 has been cured on March 11.

- Bring the 500 keV buncher into operation,
- Put the debunchers in operation and see if the whole system is stable enough (mutual couplings are difficult to anticipate),
- Later this year it is planned to introduce circulators which would reduce these couplings and to look for an increase in drive power (0.5 to 1 db),
- Fast feedback is last on the list and will only be considered if found necessary after the introduction of the other improvements,
- Computer acquisition of a further 64 parameters.

As to the performance required to meet the goal of providing 10^{13} p/p at 400 GeV, the following can be said.

With the present (end 1973) state of the Linac, the PSB has produced $7.5 \cdot 10^{12}$ p/p. It is expected that one could eventually get 8 or $8.5 \cdot 10^{12}$ p/p. So another 20 % improvement * is needed which could be expected from the above programme at least for MD and / or one Booster ring. On the other hand, to get 10^{13} p/p in the SPS, one needs 1.2 or $1.3 \cdot 10^{13}$ p/p (losses during the debunching/rebunching process and on the shaving septum), this means a further 20 to 30 % increase. It would obviously be very desirable to be able to try that intensity in the PSB; extrapolation would be much smaller than the intensity "jump" of a factor 3 successfully achieved in 1973 in the PS.

It was here pointed out that some intensity effects are not linear and there might be thresholds that one would like to find out about. It would also be very desirable to perform some studies with a higher density beam (keeping the intensity constant). The list of these studies prepared by K.H. Reich is given in Annex. One of the priorities is to find out as soon as possible if a second RF cavity is needed.

The present performance of some Linac beam diagnostic devices (current transformers; pick-up) was the source of some criticism. Remedial action was promised.

As to the debuncher in the PS beam line, there is no need for it as long as one works at the present (50 mA) intensity level.

New Linac :
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A brief summary of the status of the project, and more particularly of the civil engineering which is now underway, was given.

* This 20 % of PSB improvement needs more than a 20 % Linac current increase (or a denser Linac beam) to stay within the PSB design emittance.

Another point mentioned was that the design group had reached the conclusion that introducing a 3 MHz chopper (to ease beam observation and injection tuning in the PSB) at the 750 keV level would not be acceptable on grounds of beam stability. The construction of a 50 MeV chopper which is the only solution is not part of the project. Before deciding to build one, as a separate PS project (say in 1975), one can wait to see how the new PSB vertical distributor (see MAC No 16), which can chop a $\frac{1}{2}$ turn beam, does perform and how well it is possible to tune the PSB multiturn injection with it. In the meantime, room in the 750 keV drift space will stay reserved.

The question of the present Linac PDP 11/45 was raised and will have to be settled soon.

3. Work Programme of SM Group

A note prepared by C. Germain describing the activities of the group (MPS/SM-Note/74-9) was presented.

There was some discussion or clarification on the following points :

- The replacement of the bump coils 62 (radiation damage) should be considered preferably by dipoles. W. Kubischta is looking at a possible layout.
- The responsibility for the M amplifiers (developped by OP) will be transferred to the SM group when the development is complete; this should take place towards the end of 1974.
- The injection power supplies remain in the CCI group.
- A capacitor discharge supply (called D1000) has been provided by TC-L for powering the orbit bump for FE 16; the G1000 can then be adjusted for slow extraction only.
- For computer control, the assistance of the CCI group is required. The SM group having no specialist, the priority should be on the new PFW project. The choice of a solution with independent circuits (to provide separate field harmonic components) is only possible if one feels confident enough about the controls which must therefore be carefully studied. J.H.B. Madsen reminded that the controls specialists are very engaged already. It is clear that not all projects can be handled in parallel. The OP Group asked to be consulted on the operational aspects of the new developments.

The hooking of new auxiliary power supplies to a control computer does not present any special technical difficulty * if one is satisfied with pure acquisition and control (as for the Booster). However, a much larger effort is required for an EMAS- like solution, which is more desirable for long term operation and maintenance of the system. Specifications for these applications are being prepared.

* Manpower and computer capacity (on the Varian function generator) may create problems.

4. Pulse to Pulse Intensity Modulation

This problem was shortly raised in connection with the filling of ISR during the future neutrino runs. G.L. Munday stated that during these runs, Gargamelle has the priority over the ISR as to what beam the PS provides. No intensity modulation will be promised unless it is experimentally proven that it is "dead easy" and does not slow down the long term project of J.P. Potier. He repeated that no intensity record should be aimed at the expense of excessive machine irradiation.

These matters relate to the policy of the division and commitments to the outside can only be made by the Division Leader.

5. Next Meeting

Wednesday, March 20

Agenda : - Vacuum improvements
- Work programme of OP/Target section.

O. Barbalat

Distribution

PS Scientific Staff

A P P E N D I X

1. Relevant studies possible with present (stable) Linac beam

Assuming that a $> 3 \cdot 10^{12}$ p/p beam can be achieved in one PSB ring (using injection over more than 15 turns and accepting increased transverse emittances), the following longitudinal questions could be studied at the appropriate intensity level :

- a) suppression of longitudinal bunch instability (through RF voltage programming, reduction of beam coupling impedances, possibly active feedback; and if not achievable otherwise, through controlled longitudinal blow-up, in the limit by means of a second RF cavity);
- b) optimisation of capture and acceleration efficiencies.

2. Studies requiring denser and/or more intense Linac beam

- a) general preparation for higher density beam (I_b/ϵ_0 from 5 → 12),
- b) selection of optimum working point,
- c) final compensation of stop-bands (may require extra power supplies, more programming facilities, etc.),
- d) suppression of transverse instabilities (possibly requiring extra power supplies or perhaps active feedback),
- e) optimisation of multiturn injection.

K.H. Reich