

MACHINES AND AREAS COMMITTEE

Summary of meeting No. 68 - March 10, 1977

Present :

O. Barbalat, D. Bloess, D. Dekkers, D. Fiander, B. Kuiper, P. Lefèvre, G.L. Munday (Chairman), B. Nicolai, G. Plass, K.H. Reich, Ch. Rufer

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Replacement of TIK (800 MeV injection kicker)

Two proposals have been made to replace or improve the present system which, having been stretched\* considerably to be able to achieve its designed specification (3.7 mrad nominal, 4.4 mrad maximum), behaves very marginally.

25 failures have been recorded since the beginning of 1976, amounting to 0.28% of the total PS running time. It is an appreciable fraction of the total CPS down time which is in the order of 5% and is judged excessive for a single system.\*\*

Reduced availability was still acceptable a year or so ago when one could fall back on 50 MeV injection but is not the case anymore when all 3 PS users require an intensity which the PSB alone can deliver.

a) Improvement of the present equipment

A proposal in that direction has been made by B. Nicolai (PS/AE/Note 76-14). It consists essentially in providing a standby generator which could be rather rapidly connected to the magnet in case of failure and in installing the PFN (Pulse Forming Network) in a tight oil-filled vessel.

The cost is estimated at 500 kFr and 1.5 year would be necessary to complete the work with the existing staff resources.

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- \* i) the operational voltage has been raised from about 50 kV to 63 kV
  - ii) the system impedance has been lowered by about 25%
  - iii) the fall time has been increased by about 4 ns by lengthening one of the module in order to increase the kick strength.

\*\* Not counting 4 days of operation with 50 MeV injection because of TIK failure.

b) Replacement by FAK-type modules

D. Fiander had presented this proposal (PS/AE/Note 76-13) in the middle of 1976 but some development work had to be completed to make sure that one could achieve the desired fall time performance. The proposal consists in building 4 kicker modules identical to the present FAK units (except for the characteristic impedance).

As each module is capable of a 1.5 mrad kick and 4.5 mrad are necessary for injection, normal operation will only need 3 modules leaving a spare module ready in case of failure.

Tests have now shown that one can meet the required fall time performance\* which had to be relaxed when the present kicker had to be lengthened to increase its kick strength.

As one has to build new magnets and a building to house the pulse generators as well; the total project is estimated at 1.75 MFrs and will take 2.5 to 3 years to be completed.

Discussion

The two proposals can both meet the needs of the operation and are adequate for future beam performance as far as they are known today.

The second proposal was preferred in spite of its higher cost and somewhat longer time scale for the following reasons :

- i) It is redundant (4 modules of which only 3 are needed and one standby), this type of arrangement has given very satisfactory reliability results, in particular for the FAK and the PS RF system.
- ii) Construction is standardized and similar to the other fast deflectors used around the PS (same pulse generator and electronics), this will ease maintenance and avoid having to rely excessively on a small dedicated team.  
It was considered that in a time of reduced manpower, this fact was well worth the extra expenditure.
- iii) Performance is superior though it is not the main justification
  - a 6 mrad kick (4 modules) is available for machine studies or special modes of operation;
  - the shorter fall time permits to work with longer PSB bunches, provided that the PSB kickers are improved accordingly (increased beam stability obtained by RF voltage reduction);

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\* Since the MAC, the tests results have been evaluated; these show that the proposed system would have a 95-5% fall time of 39 ns compared to 43 ns for the present stretched system. Taking the jitter into account, there would be a further gain of 2 ns in favour of the proposed system.

- the rise time is also shorter (5-95%, approximately 37 ns). This feature is not required by the present injection mode but adds to the PS flexibility\*. Past experience has shown that one has nearly always used performance margins once they were made available.

Other factors have also been considered and included in the design, namely : safety, controls, suppression of noise interference. (It is a priori much better than the present TIK).

Operation and people involved in machine studies stressed the strong need to proceed as fast as possible with this project. They urged that the construction team avoids to accept deadlines for other commitments which would increase the already long completion time for this project.

#### Future Meetings

End March/early April	:	Review of SC Projects
May	:	Beam Loss Monitors.

O. Barbalat

#### Distribution

PS Scientific Staff

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\* This feature would allow the injection of two PSB pulses of 10 vertically recombined double bunches (see PS/DL/Note 76-13).