

## NOTES ON EXTRACTED BEAMS

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Introduction

The purpose of this note is to give the reader a general survey of the plans for fast and slow extraction for about the next three to four years. During this period the major pieces of the Conversion will be completed, leading to some incompatibility with present extraction equipment. The constraints on the operation of extracted beams will be examined as this obsolescent equipment is replaced.

Fast Extraction

The Near Future

The present fast extraction method uses a three step process with a fast kicker at L10, thin septum at A10, and ejector magnets at B10 and I10. Once a bunch has been deflected by the A10 magnet either B10 or I10 can be powered to achieve extraction into the Southwest or North Areas respectively. The choice can be made of either single bunch or full beam extraction. In the single bunch mode the I10 beam can be pulsed twice in one AGS cycle separated by about 100 msec. A10, B10 and I10 magnets are positioned by hydraulic ramming systems.

B10 has not been used for the past two years. It is planned to reactivate the beam to the Southwest Area by the end of 1968. The B10 power supply is

to be moved to a small building outside the tunnel next to the B8 sleeve. This beam will not be capable of being pulsed twice in one AGS cycle.

It is planned to complete improvements to the drawer assemblies at A10, B10 and I10 by the end of 1968 or no later than the spring of 1969. These changes should improve reliability and include the replacement of the present chevron seals by metal bellows. In addition a complete spare will be built for both the septum and ejector assemblies.

#### Post New MG Set Installation

The AGS repetition period will be about one second at this time, without flat top. The ejector magnet, thin septum and fast kicker will all be modified to be compatible with increased duty factor. However, problems may arise with the hydraulic system as the stroke takes about 350 msec and the insert cycle cannot be started until after transition. A complete cycle of the ramming system not including the wait for transition requires one second. This may lead to problems with multiple targeting combined with single bunch extraction modes. No changes will be made to the basic swash plate hydraulic pump.

#### Post 200 MeV Injection

It is estimated that the beam size will be increased by  $\sqrt{2}$  after this part of the Conversion project is finished. The deflecting force of the present fast kicker is not sufficient to bend the beam enough to clear a thin septum magnet and a new kicker is under development. The deflection at 30 GeV/c is 2 mrad and one to four bunches or full beam may be deflected. This kicker is described in AGS Division Technical Note #48. In addition a new single turn thin septum ejector magnet is being designed which together with the fast kicker provides a two step ejection process. These would be designed to accept the increased beam size, duty cycle and intensity of the fully

converted AGS. All assemblies will be made conversion compatible. At the present time the design calls for an ejector magnet which is not rammed, therefore a set of backleg windings would have to be used in conjunction with this scheme.

Present plans call for the kicker to be located at G20. Although primarily designed for extraction at H10 it seems likely that the fast beam out of I10 could be maintained until the changeover to H10, if a new thin-septum ejector magnet is installed at I10. However, a great deal of work would be involved as the ejector power supply is likely to be quite large and should be located as near to the ejector magnet as possible. The orbit deformation using backleg windings or separate dipoles would have to center on I10 or H10. Also, the present plans call for a 22 mrad ejection angle out of H10 as opposed to the 27 mrad ejection at I10 which may pose a problem. The kicker polarity would be reversed for I10 ejection, however, this is a relatively short job. Simultaneous running of I10 and H10 does not seem possible.

There are no plans to rebuild the fast kicker at I10, the A10 septum or the B10 ejector or to redesign for a two step process at B10. The beam to the Southwest Area will be discontinued at this time.

#### Slow Extraction

##### The Near Future

New drawer assemblies, more radiation hardened, will be installed at F5 and F10 before this beam is run operationally. The permissible duty factor for the F5 septum magnet at 25 BeV is 20%. This would allow a 470 millisecond flat top for slow beam with the present machine.

##### Post New MG Set Installation

No changes are contemplated on the magnets at this time. Therefore, the

slow beam flat top will need to be shortened to maintain the present F5 septum magnet duty factor.

Post 200 MeV Injection

It seems likely that the magnet apertures will have to be increased for post 200 MeV injection. This, in turn, will require some power supply modifications. In addition the duty factor for the ejection magnets will be increased, perhaps to 50%. This will necessitate a complete rebuild of the F5 magnet and perhaps the F10. These matters are under consideration. All assemblies will be made conversion compatible.

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