minimized in this design so that the mechanical problems can be given full consideration. Details are given in Ref. 1. The pulsed septum magnet is to be followed by a conventional dc magnet.

1. Questions

How do you constrain the primary? Fiberglass and epoxy are used. One could leave the core out of the primary and have zero force on the primary but it would take twice the power.

Do you presently have any beam loss on the system? Yes.

What is the PSR beam size at the septum? About 2-cm half width.

Could you increase the efficiency with a small-back yoke? A small-back yoke will be included in the box.

Reference

1. M. Foss, K. Thompson, and W. Praeg, "A Transformer Septum Magnet," paper J3 of 1979 Particle Accelerator Conference.

D. H⁻ Injection, Y. Cho, ANL

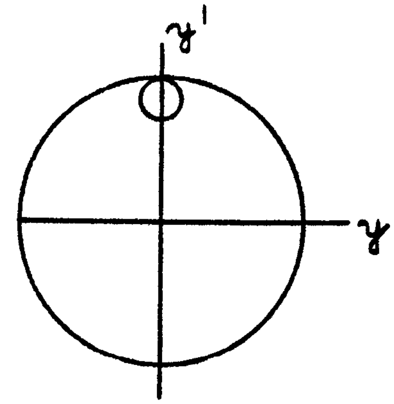
Let us consider the emittance of a linac and the acceptance of circular rings. For example IPNS II and SNS have acceptances of:

$$\left.\begin{aligned} \varepsilon_H &= 60\ \text{cm}\cdot\text{mr} \\ \varepsilon_V &= 50\ \text{cm}\cdot\text{mr} \end{aligned}\right\} \quad \text{SNS}$$

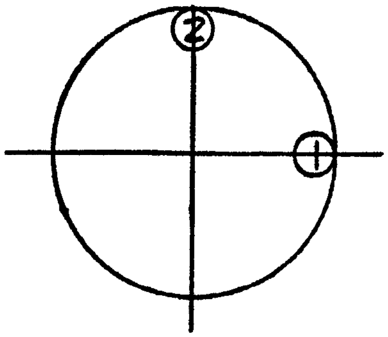
$$\left.\begin{aligned} \varepsilon_H &= 80\ \text{cm}\cdot\text{mr} \\ \varepsilon_V &= 40\ \text{cm}\cdot\text{mr} \end{aligned}\right\} \quad \text{IPNS-II}$$

Both machines take linac emittance, $\varepsilon_L \approx 1$ cm•mr. Therefore, in principle for IPNS II one can inject 80 x 40 = 3,200 turns, and for SNS 60 x 50 = 3,000 turns based on the acceptance consideration. However, IPNS II is designed to inject 500 turns, and 300 turns for 8 ns. Thus, there is disparity in the number of turns one can inject into the circular machine and number of turns one intends to inject. Even if one takes into account some factor of two dilution in emittance, there still is a large disparity in the possible number of turns one can inject and the intended number of turns. Thus we have to consider how we are going to inject.

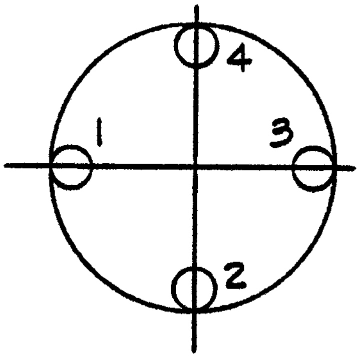
Now we consider the phase space filling of turn by turn at a given point in the ring, and assume the tune of machine is N + ¼, i.e. 2.25, or 4.25. The following sketch shows turn-by-turn filling.



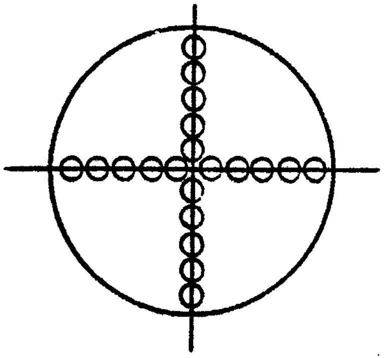
1st turn



1st and 2nd turn



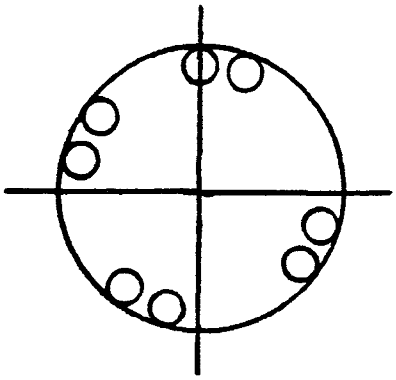
1st to 4th turn



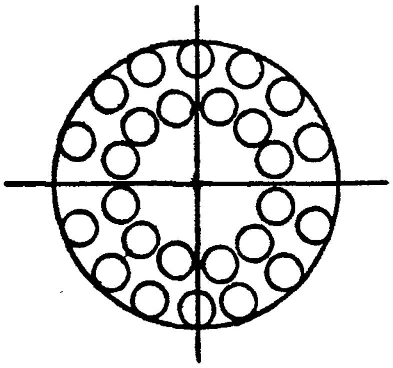
1st through 20th turn

In the above sketch we assumed for simplicity that the space charge effect is turned off, and can conclude that the charge distribution in real space is lumpy.

The question is then what one has to do to fill the beam uniformly in either real space or phase space. Here again we first consider the case with no space charge effect. We make the tune of machine $\nu = N + \frac{1}{4} + \delta$, and δ will be controlled by adjusting the lattice elements. Under this condition, filling will be as shown below.

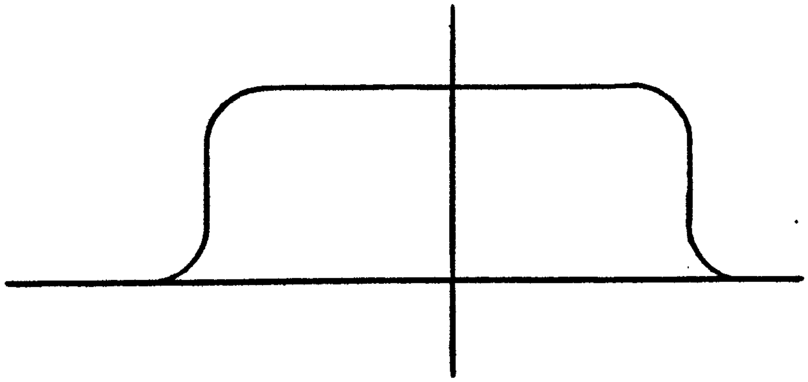


The separation shown in the above sketch is related to δ in the tune, and as the filling of the outer part of the acceptance is done, then the injection angle and the parameter δ are further adjusted to fill the inner part of the phase space as shown below.



Thus by adjusting the injection angle and δ, one can achieve the desired distribution of charges.

We believe that the best distribution for the space change consideration is uniform distribution in the radial space with tails as shown below for Landau damping.



So far our considerations have been without the space-charge effect; now we consider the space-charge detuning which brings in complications. However, the solution is still there as long as we maintain $\nu = N + \frac{1}{4} + \delta$ with taking into account the space charge, then similar argument can be made.

E. Injection for the PSR, D. W. Hudgings, LASL

For H^- injection at 800 MeV, a bumped orbit is hard because there is only about a 4.5-m straight section. It also may not be good to keep the beam on a foil for the full 8 ms. Pulsed bumps would be especially difficult in the short-pulse work.

An alternative is to use neutral-beam injection whereby a magnetic field strips off the first electron. The beam continues to be further stripped by the moving wheel with foils (as ANL does in Booster II). Gas stripping is only ~ 50% efficient and is not practical here.

Using magnetic field dissociation, the stripping length needed is about 1 mm at 1.8 Tesla. This is an extrapolation of other data so measurements are to be made on a ps scale, but using the extrapolations we propose a length of 6 or 7 mm at 1.7 Tesla to get 100% stripping while adding 1 mrad to the beam half angle.