Stacked Injector Rings Planned for CERN PS

An improved injector for the CERN 28-GeV proton synchrotron is expected to increase its maximum proton flux by a factor of ten to 10^{13} protons per pulse. The repetition rate will also be increased to one per second, with a new magnet power supply, by a factor of between 1.5 and 3 depending on the energy.

The new injector will consist of four 800-MeV synchrotron rings, with a total circumference equal to that of one turn of the proton synchrotron, stacked pancake fashion alongside the big ring (figure). These slow-cycling, strong-focusing rings will share common magnets with four gaps to each magnet. They will be fed by the existing 50-MeV linear accelerator, which is to be improved, and will eject their 800-MeV protons sequentially into the main ring so that one complete turn will be filled on each cycle. Helmut Reich, in charge of the new booster program, told PHYSICS TODAY that this injection process is expected to raise the space-charge limit on beam intensity in the proton synchrotron by a factor of ten without any corresponding increase in the angular divergence of the beam; experiments with small external targets will therefore receive the full benefit of the improved intensity.

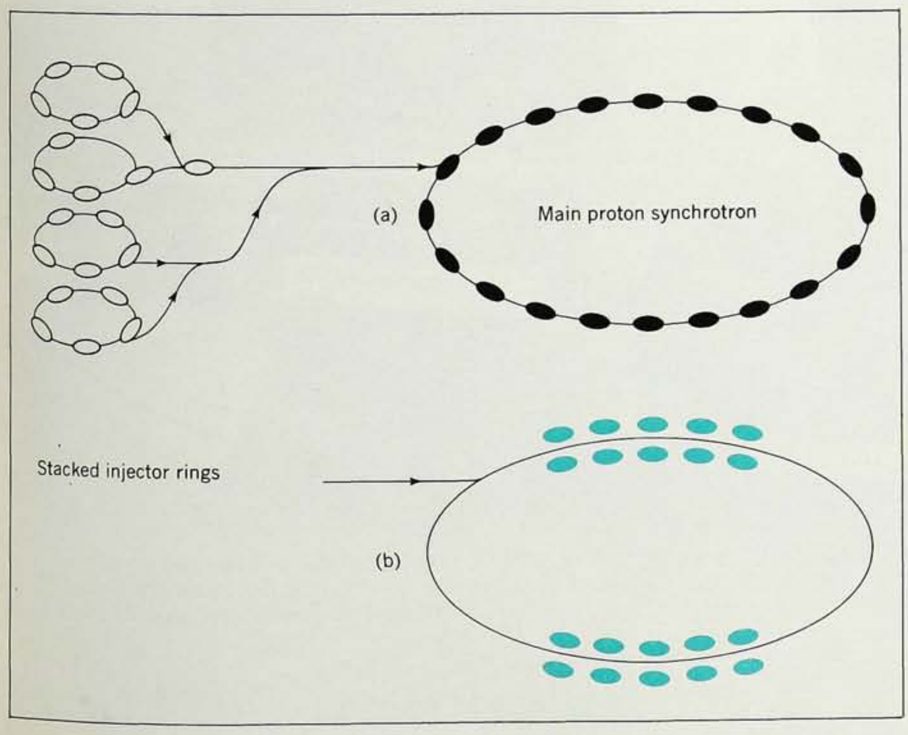
Alternatively the four booster rings can be grouped into two pairs so that their total pulse of protons can be injected into only one half, or even one quarter, of the main accelerator ring. It is expected that bunching the pulse like this will improve the interaction rate in the intersecting storage rings now under construction (PHYSICS TODAY, February 1966, page 66).

A study of the likely radiation problem with these improvements suggests that the design peak intensity from the booster will not be continuously usable; the limit on the extracted beam at 25 GeV is expected to be 3×10^{12} protons per sec.

The magnet power supply improvements should be completed by the middle of this year; the new booster rings will take five years to build after authorization is obtained.

Other new equipment for the CERN proton synchrotron include a French heavy-liquid bubble chamber for neutrino physics and a proposed 3.5-meter hydrogen bubble chamber to be built by CERN, France and Germany.

NEW INJECTION SYSTEM for CERN 28-GeV proton synchrotron. The four stacked rings (left) can be switched to inject either sequentially to fill the main ring completely (a) or in two groups to fill half of the ring at double intensity (b).



Pulsed Radio Sources May Be Neutron Stars

At least three radio observatories have recently reported an entirely new type of radio source that emits pulses with extremely stable repetition frequency and apparently random amplitude. It is tempting to identify these sources as neutron stars, postulated but not yet observed, or as white dwarf stars. Observations with optical telescopes are under way to look for visible radiation from these sources and to see whether the same pulsation occurs.

The discovery was made by a group (A. Hewish, S. J. Bell, J. D. H. Pilkington, P. F. Scott and R. A. Collins) at the Mullard Observatory of Cambridge University by the method that is becoming traditional for advances in radio astronomy—tracking down an annoying source of interference. The "interference" detected with their new 470 × 45-meter antenna array turned out to be coming from a fixed point in the sky, therefore not terrestrial, and to consist of pulses whose repetition frequency, 1.3373 seconds, stays constant to better than one part in 10^7. A search for similar sources soon turned up three others, and the observations, started last September, were reported in *Nature*, 24 Feb. On 28 March, at a University of Virginia symposium, Hewish released the coördinates of these other three sources and proposed the names "Pulsar" 1,2,3 and 4 for those so far discovered.

Sir Martin Ryle and Judy Bailey, also of Cambridge, wrote in *Nature*, 9 March, that they had established a more accurate position of the original source with different instrumentation, and they made a tentative identification of the radio source as an 18th magnitude blue star on a Palomar