F. The Proton Storage Ring Project at the WNR, G. P. Lawrence, LASL

The Proton Storage Ring (PSR) at LAMPF is a device which will provide very large pulse-intensity increases (100 to 1000 times) to the Weapons Neutron Research Facility (WNR), as well as an enhanced repetition-rate capability. The PSR acts as a pulse compressor, converting long-proton bursts from the accelerator into very short but very intense bunches. This capability enables many more neutrons to be generated in the WNR target with pulse lengths suitable for time-of-flight measurements, and also enables experimenters working with different neutron energies to use the facility simultaneously. After completion, scheduled for 1984, the PSR addition to the WNR will make this facility the premier pulsed neutron source in the world over an exceptionally wide-energy range (thermal to several hundred MeV).

At the beginning of calender year 1979, the PSR appeared as a $16.7 M line item construction request in the fiscal 1979 budget, and received Congressional approval at that level. However, as a result of discussions between LASL and DOE, the project design has been recently upgraded to permit operation at average currents of 100 μA, five times greater than previously planned, and to allow the option of running at even higher (up to 400 μA) currents in the future. The upgrade, which consists mainly of a larger aperture magnet system and a larger underground tunnel to house the Ring, brings the total project cost to $21.1 M. It is expected that $2.0 M will be released in FY-1979 to support detailed design and engineering of buildings and equipment. The higher average proton current that the upgraded design will provide makes possible a greatly expanded materials science program at the WNR using thermal-neutron scattering.

The PSR is being designed for flexible, multimode operation. It will use state-of-the-art accelerator technology, including the recently developed method of continuous-beam injection using the stripping of H^- ions. Figure I.F-1 is an artist's conception of the project. In the illustration, one sees the three major structures associated with the PSR project. In the center foreground is the Ring itself, which is placed in a 5-m by 5-m underground tunnel about 100 m in circumference. Located above the Ring is a service building, which houses power supplies and other support equipment. A laboratory support and staging building is located adjacent to the Ring. The PSR design features 10 identical focusing and

bending cells, characterized by magnets having 15-cm vertical apertures and 12 kG fields, and incorporates systems for H^- stripping injection, rf bunching in two operating modes, ultra-fast extraction, and instability detection and suppression. Conceptual design of the structures and Ring equipment systems has undergone steady evolution during the last year. The theory of PSR operation has also been the object of considerable effort throughout the year.

The project involves an extensive component research and development effort, which can itself be expected to further the technology of storage or accumulator rings. This program was initiated in 1978. Work has begun on development of the extraction kicker charging system, fast feedback instability control system, the first harmonic rf bunching system, and the beam position monitoring system. In addition, vacuum components are being tested and a beam induced electron multipactoring experiment is being set up.

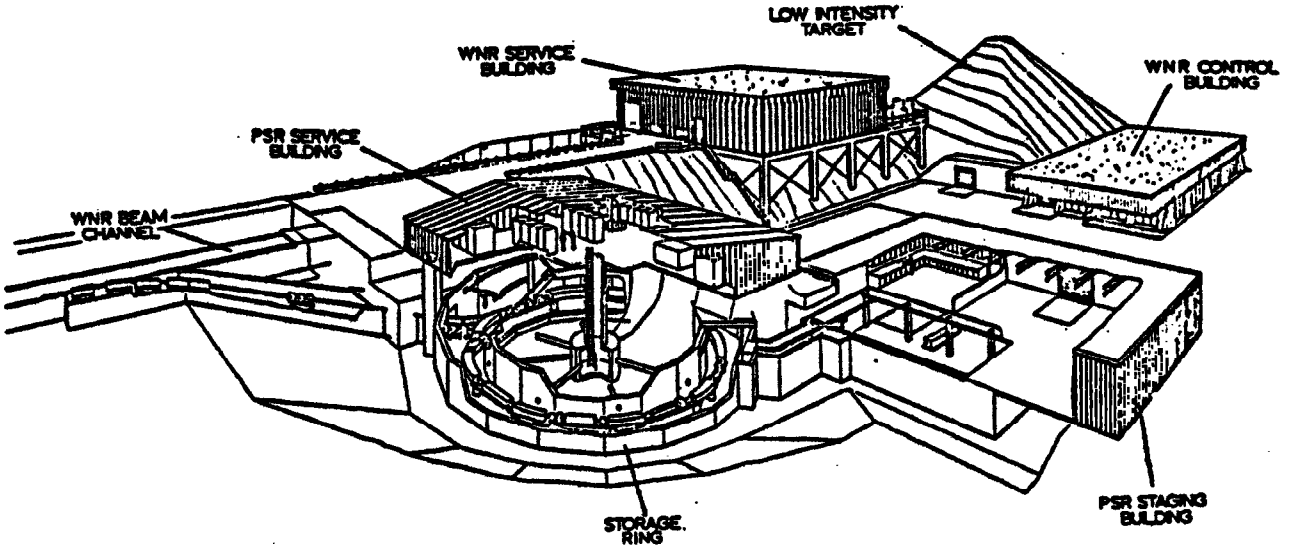

Fig. I-F.1. Proton storage ring location at the WNR.