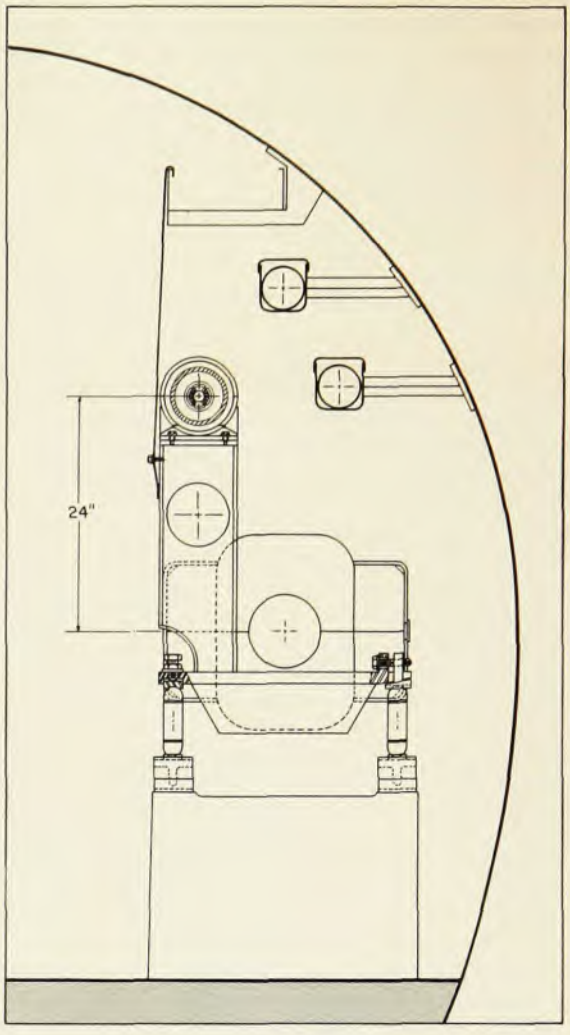

Energy doubler proposed by Batavia. Cross-sectional view shows ring of superconducting magnets mounted two feet above the existing main ring of conventional magnets.

ducting ring is doubled, and this doubling, along with rf acceleration, doubles the proton energy.

"In a sense," said Wilson, "the old main ring would become a booster accelerator for the new main ring, now made of superconductors." Many of the problems related to the use of superconductivity in pulsed accelerators would be reduced because the injection field of the new magnet would be very high. It would only be necessary to double the field, from about 22 kG to about 45 or 50 kG, rather than raise the field all the way from zero to 50 or 60 kG. The magnets would be small in aperture, so that the power supply would be a manageable size, and, of course, the small magnets would be cheaper than large ones. Wilson expects that operation above 200 GeV would be cheaper with the superconducting magnets than with the present copper and iron magnets, and that installation of the superconducting magnets might make additional water-cooling or electrical-load smoothing devices unnecessary. He stressed, however, that his projection was based "only on the most preliminary of studies."

Experimental work on superconducting synchrotron magnets is going on at Brookhaven, Lawrence Radiation Laboratory, Saclay, Karlsruhe and the Rutherford High-Energy Laboratory. At Brookhaven, a study has been done on the feasibility of converting the 33-GeV alternating-gradient synchrotron to a 120-GeV synchrotron with superconducting magnets.

The recently approved 300-GeV CERN accelerator (see page 63) may also use superconducting magnets. In the "missing-magnet" design, the accelerator ring would initially include only every other magnet, and would yield 200-GeV beams. The additional magnets would be added later, and so options could be kept open to see how superconducting-magnet technology progressed. Installation of superconducting magnets in the gaps would increase the maximum energy to 700 GeV, compared with 400 GeV for the conventional magnets, and might eventually provide 1000 GeV.

Summarizing progress at NAL, Wilson told the committee that construction of the booster synchrotron, which takes 200-MeV protons from the linac (finished last December) and raises their energy to 8 GeV, is now complete; the booster is now being tested and has already produced a 1-GeV beam. The four-mile long main-ring tunnel has been built, and about half of its 1000 magnets are in place. Beams of 1-GeV protons from the booster, in fact, have been injected into the main ring, and studies of their orbits are under way.

NAL has had a slower than expected funding rate. Wilson complained to the committee that they have so far received only $150 million of the projected $250 million for construction, and only $13 million of the $60 million for equipment. President Nixon's budget for fiscal year 1972 includes $48 million for construction, $11.9 million for operating funds and $8 million for equipment. "We have been responding to this low rate of funding by doing only the most urgent construction, by making sure that no contingencies arise, by keeping the number of employees to an absolute minimum, by exploring technical innovations—such as the energy doubler—to keep down operating costs, and by scrounging used and old-fashioned equipment to bolster our meager equipment funds. . . ." MSR

New coordination between universal and atomic time

Coordinated Universal Time (UTC), the time scale based on the Earth's rotation, will be changed on 1 January next year to ensure that the difference between UTC and International Atomic Time (IAT) will always be a whole number of seconds. The plans, approved by the International Radio Consultative Committee at its February meeting in Geneva, should simplify life for physicists who use precise frequency generators or other precise timing devices.

At present the time scale based on the earth's rotation and the atomic-based scale are coordinated by slowing the atomic scale and by adding or subtracting fractions of a second several times each year. On 1 January, UTC will be reset a few hundred millisec to differ exactly 10.000 sec from IAT. Thereafter, "leap seconds" will be added every 12 or 18 months to keep a difference of an integral number of seconds between the two scales.

Mauna Kea observatory has 88-inch telescope running

Atop the extinct volcano, Mauna Kea, 13 600 feet high, the University of Hawaii's new 88-inch reflector telescope is now operating. The instrument was manufactured by the Boller and Chivens division of Perkin-Elmer Corp. Two 24-inch telescopes are also located in the laboratory.

The Mauna Kea complex cost $6 million, $3 million of which came from NASA, $1 million from NSF; the state of Hawaii paid the rest. Its low latitude allows observation of more southerly stars than can be obtained from mainland observatories. □