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ATLAS ACCELERATOR LABORATORY REPORT

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ATLAS, in its first full year of operation, provided 3864 hours of beam time; nearly twice as many hours as in FY85. An additional 1590 hours were devoted to maintenance and improvements for a total of 5454 staffed hours in FY86. The accelerator operated reliably during the year's 51 experimental runs providing a wide variety of ions, ranging all the way from ^{1}H to ^{127}I. The use of the new high-resolution injector was restricted by continuing problems with the reliability and regulation of the NEC 300 kV power supply. A recently completed redesign by NEC of the power MOSFET driver circuitry seems to have solved much of the mortality problem, but inadequate and intermittent regulation difficulties continue to plague the supply.

Conductive tires for the Pelletron chain pulleys were installed in the FN tandem, replacing the metal bands that formed the electrical connection between the pulleys and the chain. The charging system had been suffering repeated failures due to the breaking of the bands and the failures were finally traced to worn tires. The charging system has operated reliably since the change and the stability seems to be improved.

A new high frequency sweeper system has been installed at the entrance to the linac that is capable of operating at frequencies from DC to 4 MHz. The sweeper has been used to deliver single pulses to an experiment with a period variable from milliseconds to one of every third pulse. Although not tested yet, the system is designed to be able to operate in a mode where every other pulse is delivered. The sweeper allows complete flexibility in beam periods for experiments that demand periods that differ from that provided by the 12 MHz or 48 MHz bunching system.

A scheduled maintenance period in September had to be extended several weeks unexpectedly when cracks were discovered in the VCX and RF drive ports of six resonators. The resonators were removed from the cryostats for the ports to be reworked, electron beam welded and electropolished, while operation of the accelerator resumed with a partial complement of resonators. The repaired resonators have now been reinstalled and cooled and all have been conditioned to above 3 MV/m. Operation of the full ATLAS is scheduled to begin November 5.

Improvements have been made to the RF drive ports of eight resonators to correct failures in the thermally conductive ceramic insulators. The drives have been converted to inductively coupled loops and the niobium tips have been replaced with copper for better thermal conductivity. The performance characteristics of the new probes have not been well established yet. Work is also underway to redesign the VCX used for fast tuning to prevent similar problems of overheating of the tips and to allow a new style of higher power PIN diode to be used.

During the last year, considerable progress has been made on the positive-ion injector (PII) upgrade for ATLAS. The project aims to replace the FN tandem as an injector to ATLAS to eliminate, for projectiles up to mass 130, the beam current constraints associated with negative-ion sources and tandem terminal mounted carbon stripping foils. With additional linac sections, the PII will enable ATLAS to accelerate virtually any ion up to uranium with energies for A = 238 of up to 7 MeV/u. The PII will use an electron cyclotron resonance (ECR) source to generate an intense beam of highly stripped ions and will inject into a new linac section utilizing four new classes of very low beta resonators. The injector will be developed in three phases. In the first phase, the ECR source will be built and the technology of the superconducting accelerating structures for low-velocity ions will be developed. These resonators will be used in a 3 MV prototype linac that is planned for completion by early 1989. In the later phases the equivalent voltage of the linac will be increased to 8 MV and then 12 MV with the addition of more resonators. If funding is available, the 12-MV injector will be completed by early 1991.

Building modifications have begun for the first phase. The tandem vault shielding doors have been removed in preparation for the installation of additional liquid helium refrigeration and a hole has been cut in the five-foot thick shielding wall for the new injector beamline. The first four-gap quarter wave resonator has been built and tested, operating stably at 10 MV/m and with only four watts of RF power loss at 7 MV/m. Construction of the prototype of the second class of resonator is complete and testing will begin in early November. The design of the ECR source is complete and most components have been ordered. The assembly of the source will begin in December when components begin to arrive. We have decided to break away from the use of CAMAC in the ECR source controls for reasons of cost and in order to use more commercially available software. The system will use Trans-Era front-end hardware, an IBM AT compatible computer communicating to the 350-kV platform through a fiber optic IEEE-488 interface, and Intellution "The Fix" software.

Since the PII will replace the tandem as an injector to ATLAS, plans are underway to find an alternative use for this venerable machine. Two possibilities are presently being investigated: an accelerator mass spectroscopy facility (AMS) for geophysical research, and a deaccelerator used in conjunction with the PII for atomic physics research. Either possibility would entail extensive modification and enhancement of this old lady and she will, no doubt, still provide many exciting challenges for tandem accelerator engineers.

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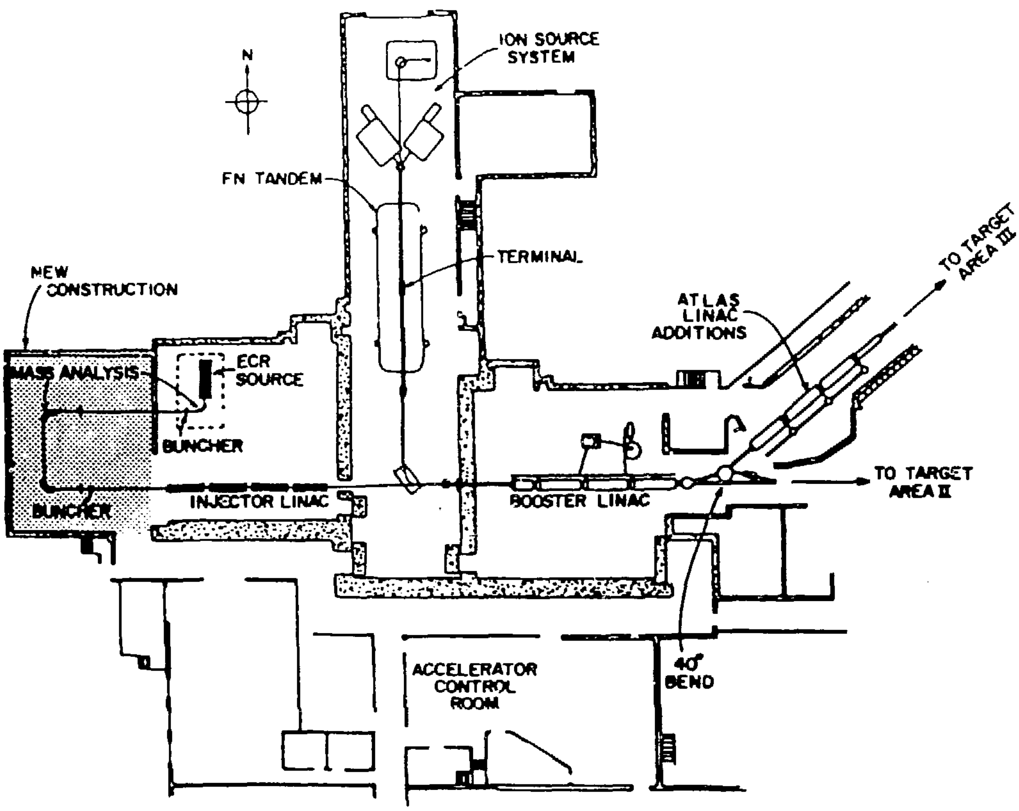

Fig. 1. Partial floor plan of the ATLAS accelerator facility showing the layout of the positive-ion injector and the planned building addition. Construction will begin in the Winter of 1986-87.