ANU Laboratory Report
ATF-SNEAP 2006
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14UD

General Performance:
The 14UD has operated 3.8 khrs this year – below our usual 4 khrs plus. In large measure this is due to the tank openings caused by the charging pulley tyre wear problems and the upgrade of the high-energy stripper. In spite of these trials, the overall performance of the machine continues to be excellent. The day after the SF6 was put into the machine after the last tank opening, the machine went to 15.3 MV with little conditioning and no sparks. Of coursed later on, when experimenters splashed a bit of beam about, there were the usual crop of 14.4 MV + sparks.

The beam transmission has improved markedly with the increase in injection voltage from 125 to 150 keV.

Chains and Pulley Tyres:
At SNEAP-HIAT 2005, we reported that the new chain ground nylon dust from the old blue nylon pulley tyres. As will be reported elsewhere, it turns out that the new chain is compatible with the new anti-static tyres from NEC. We still don't understand why the new chain is not compatible with the old nylon but we will move with the times and replace all the blue tyres with new black ones as funds allow. This will also allow the retirement of the oilers, which are not needed with the new tyres.

Unit 19 –The High Energy Stripper:
The high-energy stripper, in Unit 19, has been upgraded to computer control of the foil changer, replacing the old pneumatic actuator. Because of the outstanding success of the computerization of the terminal, with no hardware or software failures whatsoever, we arrogantly believed that the Unit 19 upgrade would be easy. As reported in detail elsewhere, it was anything but easy.

In reviewing the year's experience for this report, it was striking just how many problems have occurred at Unit 19. This is consistent with the spark induced stresses being larger there than in the terminal.

The stripper manifold takes the place of one of three 11-gap tube section so 1/3 of the column must be shorted. The loops of wire that short the spark gaps on the column are subject to high currents during a spark and fail open circuit from time to time. There is a compromise between keeping the RF inductance of the loops large and not making them too puny.

There have also been failed resistor connection loops and loose stringer connections just over the past year or so. It may be that the second stripper, by interrupting the modularity of the high-energy end of the machine, causes reflections of the RF discharge wave magnifying the electric stress here.

Posts and Things:
The program to refurbish column posts has continued with only 6 units still with the original posts. The details of the post refurbishment are covered elsewhere.

There was sparking from the bearing blocks supporting one charging pulley through the insulating sheets. This was remedied rounding the sharp edges of the bearing blocks to reduce the electric field enhancement.

LINAC

Resonator Control Card, RF amplifiers and Computer Control:
The new resonator and computer control were commissioned in May 2005. The resonator control cards were manufactured by BARC in Mumbai and integrated into the accelerator control system. Dressler, Germany developed RF amplifiers for us. These two upgrades have substantially improved the ease of operation of the LINAC. During the last year of operation the system demonstrated very high stability, simplicity of operation and high reliability allowing sustained operation of the LINAC facility.

Experiments:
In July 2005 the LINAC was used to boost the energy of $^{58}Ni^{+22}$ beam from 195 MeV to 327 MeV. In May 2006 the LINAC boosted the energy of $^{62}Ni^{+22}$ beam from 200 MeV to 329 MeV.

Resonator Developments:
In September 2006 Cryostat #4 has been re-plated. New clean room facilities and practices have been established in all resonator plating/assembling areas. Measurement of the non-linear surface impedance, intermodulation distortion and third-harmonic generation was conducted in the most LINAC SLRs. The measurements were performed at fundamental frequencies of 150 and 135 MHz with the IMD tone separation of 100 Hz.

Efforts are now devoted to the development of the low velocity two- and three-stub resonators. The first two stub-copper prototype is being manufactured.

The electromagnetic and mechanical properties of two-stub and three-stub resonators, the demountable joints and control of frequency splitting have been investigated with Microwave Studio. A low current superconducting joint, not employing a gasket, has been designed and evaluated. Novel displacement and rotary tuners have been investigated. Improvements in the PbSn plating process have been pursued. The texture and morphology of the films have been studied using TEM, SEM and AFM techniques. A JEOL Electron Spin Resonance spectrometer has been commissioned and is now being modified to investigate the superconducting properties of low and high temperature superconducting materials.