AUSTRALIAN NATIONAL UNIVERSITY

DEPARTMENT OF NUCLEAR PHYSICS

14UD TANK OPENING REPORT NO.17

July 4th and 5th, 1979 (1½ days open)

PREAMBLE:

The 14UD was last closed on May 3rd and during the 62 days of operation since then the accelerator has performed very well in terms of achieving and maintaining high voltage; however, loading has been higher than usual and is attributed to inefficient pumping in the terminal. Ion pump indication has been full scale for some time and the terminal sublimers were last examined in October 1976.

While it was planned to take a portable ion pump supply into the terminal at the first opportunity and check the performance of the pump, the recent tank opening was made as brief as possible in order to accommodate the experiments of two short-term visitors, and the terminal was not lowered.

"Eerie stability", which we have now come to expect immediately after a tank opening, returned following the May closure and remained in evidence for some weeks, after which it became less eerie as the days progressed. Negative self-charge on Chain 3 refused obstinately to be oiled away, and then the same effect, but to a lesser degree, appeared on Chain 2. Chain 1 responded always to oiling.

About 10 days before the recent opening Chain 3 exhibited instabilities and erratic charging currents, and it was left off whenever possible. Other column instabilities, not related to Chain 3, occurred and all H.E. units were shorted individually. The fault persisted, but during similar diagnostics on the L.E. column, it became more obscure and eventually diminished to the degree that shorting diagnostics were not carried past the midsection (between units 6 and 7) and, since only voltages of about 8 MV were required at the time, the machine was acceptable and the schedule continued.

Report No.15, page 4 refers to our anticipation of a major realignment in the near future because of poor transmission which has been a problem for several months. The discovery of a contributing factor, if not the only one, and subsequent improvement in the transmission, will be referred to later.

On July 2nd the generating voltmeter ceased to function. The decision was made to take out the gas, remove the motor from outside and only open the bottom door, without taking down the platform, in order to have a quick look at the chains and oilers while the GVM was being repaired.

THE TANK OPENING:

One of the profound advantages of a vertical machine is that, when something is amiss, clues descend from their origin to the bottom of the tank. The young investigator might find anything from a heap of chain to a small screw, or a few fragments of some elusive substance. On this occasion one of the short bronze rods which make contact between the charging pulleys and their brushes was lying on the floor beneath the pulley of Chain 3; it had unscrewed itself from the threaded stud, presumably when the chain had motored backwards when turned off. The stud was just missing contact with the carbon brush and this seemed to explain the metering instabilities mentioned in the preamble.

Also on the floor were fragments of mangled and partly melted steel, suggesting a bearing housing other than that of the GVM which has a low torque motor incapable of such damage. A few slivers of black rubber were found as well, and clearly the platform had to be lowered after all.

BEARINGS:

The cover of casting 10, and the rings above and below, were coated with black mess in the vicinity of the shaft. The alternator cavity was thickly coated and contained fragments of rubber and bearing housing. A few bits of bearing housing were found on the lower castings. Three shaft screws were missing from the 'ceiling' of Unit 8, two of which were lying on the floor of the unit. These screws are not fitted with shakeproof washers and we find it hard to believe that all screws are not tightened when bearings are changed, implying that perhaps shakeproof washers should be fitted throughout the machine.

When the L.E. shaft was run bearings in castings 4 and 5, and 9 and 10 were found to be very noisy. All the bearings in the L.E. shaft are overdue for replacement, now having clocked 9,600 hours, but because of machine commitments it was decided to continue with them and schedule a shutdown as soon as practicable, leaving the upper shaft off whenever possible.

GVM:

The bearings had seized and an identical replacement motor was fitted; however, the one removed appeared, on test, not to have suffered at all. In January 1977 instability of the GVM was traced to the original motor which was checked to be turning at only 830 rpm. A new larger motor was fitted and checked at 2,800 rpm (Report No.6, page 1). In order to accommodate the new motor in the housing the original BNC feedthrough was changed for a microdot, but even this wa so close that the back of the motor pressed lightly against the thin coax lead. When replacing the motor on this recent occasion it was found that the microdot coax braid was badly worn by motor vibration. The straight microdot connection was replaced by a right-angled one which gave better clearance but we shall probably make a deep housing and revert to the more robust BNC connector.

CHAINS:

The chains and pulley rims in positions 2 and 3 were better described as arid than dry, and the oil reservoirs in these positions had barely lost any oil at all In position 1 the situation was better and the reservoir was empty. There was oi on the floor between motors 1 and 2. Though of a similar type the Pongrass oiler in position 1 is of a different design to the other two. Oilers 2 and 3 were disassembled, gaskets renewed and then all three were tested with varying gas pressures; no reasonable amount of oil was emitted by either 2 or 3. Considering the highly unsatisfactory condition of Chains 2 and 3 efforts were made to get liquid oil, rather than a mist of oil from these two units in order to make them approach the effectiveness of No. 1, which ejected oil and not mist. The sintered copper plugs intended to generate a mist, were removed from oilers 2 and 3 which were then adjusted to wet a finger lying on the rim while still not exuding a jet of oil.

All chains were then oiled by traditional hand in the traditional way, their final condition being wet with a film of oil, as were the pulley rims. It is interesting to recall the early experimental days of the 14UD when persistent troubles with the original type of corona point assemblies, and inadequately shielded electric circuits in the tank, forced frequent tank openings. Chain oiling was by hand, and when the chains were turned off the pulley rims settled into contact with felt pads which were religiously soaked with an excess of oil before the tank was closed. The pads did not often dry out in the environment much before the next tank opening when the chains were once more oiled by hand. In those days the chains rarely suffered from a lack of oil to the degree they do at present if our existing oilers become ineffective.

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POINTS:

All tube and column points were looked at and those in the unit opened for bearing replacement were studied. The initial sharpness of the needles, which does not last very long, was of course absent; however, the condition of the needles seems to have changed very little during the past few tank openings and we found no evidence of deterioration suggesting that an overall replacement will be necessary in the near future. This is substantiated by the excellent voltage performance of the machine, its stability under good conditions and its cheerful willingness to run stably at 7.5 MV without shorting rods.

The characteristic brown deposit on the backs of the point assemblies had not increased noticeably since the last tank opening. The corresponding deposit on the terminal was over a small area, and quite dry.

CLEANING:

The entire column was blown with a jet of nitrogen and tacragged thoroughly in deference to the absent co-author whose pet, and highly fruitful, obsession the procedure is.

CHARGING TESTS:

The chains were run without volts to observe their mechanical stability. All ran excellently, though Chain 3 has stretched and will almost certainly need to be shortened next time.

With the motors off the charging system was run up to 10 kV without trouble. Chains 1 and 2 performed well during final charging tests and instability in charging current led to the discovery of a loose terminal lug on its barrier strip. This may have contributed to the instability in the chain attributed earlier to the missing brush contact.

MACHINE PERFORMANCE:

The 14UD went easily to high voltage after gassing up, and when the first beam was analyzed "eerie stability" was back with us. We believe this attribute depends strongly on effective chain oiling, since we always achieve it following button-up after the chains have been oiled by hand.

SOURCES:

The sputter source, usually easy to run, and trouble free, began to need harder driving to produce its usual beam intensities. Eventually beam fell off rapidly and on June 25th, ceased altogether. On opening the source the frit was found to be almost entirely blocked by molybdenum sputtered from the suppressor electrode. A new ionizer gun, consisting of frit and reservoir, was fitted and the former conditions returned. There was a decided bonus in that we found transmission through the machine substantially improved. It is clear that the blockage began to build up on the centre of the frit, degrading the emittance of the source progressively as the blockage increased in area.

The lithex source has received some attention. The T-piece over the source pump had a historic leak, useful over the years to establish whether the leak chaser was working. When the beamline was dismantled in order to replace the original lithex einzel with an ANU design the T-piece was taken off for examination and re-welding at the lower flange. A thin crack, through which glyptal had passed, could be seen inside the T at the lower flange. After re-welding a series

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of thin cracks appeared in the same region and the original T-piece was abandoned as beyond redemption. A new T-piece made at ANU was fitted and established as leaktight.

MISCELLANEOUS:

Some new control panels and protective circuits have been put in, including a latching relay which can be tripped from the main console so that, after five years, it is no longer necessary to return to the top of the tower when one has forgotten to send beam from the L.E. cup down to the control room.

The Universal Voltronics 200 kV box power supply, which has been out of commission as a stable supply since the capacitor stack blew up a few months ago, was put back in operation as soon as the replacement components were received. It was found, when removing the old resistors and capacitors that a number of resistors had increased considerably in value, some by a factor of 4, thus increasing the voltage across individual capacitors and leading to the cascading breakdown which eventually occurred.

T.A. Brinkley

July 15th, 1979.

David Weisser is at Oak Ridge until December.

MONTH	DATE	DAY	GROUP	LINE	
APR.	16	MON			
	17	TUES	ECK, LEIGH, OPHEL, CLARK	5	Be 60 MeV
	18	WED			
	19	THURS			
	20	FRI	HAY, TREACY - SOURCE TESTS		
	21	SAT	CONLEY, ET AL	1	^{13}C 59 MeV
	22	SUN			
	23	MON	CLARK, OPHEL, ECK, WEISSER	5	^{7}Li 52 MeV
	24	TUES			
	25	WED	SPEAR ET AL	6	^{30}Si 120 MeV
	26	THURS			
	27	FRI			
	28	SAT			
	29	SUN			
	30	MON			
MAY	1	TUES			
	2	WED	TANK OPEN - LOWER TERM. ALTER.		
	3	THURS	Put in Gold + Ce isolide cover		
	4	FRI	ECK, CLARK, WEISSER, OPHEL, LEIGH	5 6	~~45 MeV~~ 60 MeV ^{7}Li ~~90~~
	5	SAT			
	6	SUN	LEIGH, SIE, NEWTON	5	^{28}Si ^{58}Ni
	7	MON			
	8	TUES	NURZYNSKI, ET AL. L.E Valve Actuator & chopper	5	^{16}O 67 MeV
	9	WED			
	10	THURS			
	11	FRI	HAY, TREACY, SODERBAUM Uninstall LE Valve Preamps	7	Au
	12	SAT			
	13	SUN	CLINE COMMITTEE (JRL, GDD, JON, SS)	1	^{58}Ni
	14	MON			
	15	TUES			
	16	WED	NURZYNSKI	5	62.5 MeV ^{16}O
	17	THURS			
	18	FRI			
	19	SAT	POLETTI, DRACOULIS, FEWELL	1	$^{10,11}B$ $^{12,13}C$
	20	SUN	6 A.D'Cs & ALCORTEC TAC's + other electronics required		
	21	MON			
	22	TUES			
	23	WED	ENGE DETECTOR INSTALLATION	5	^{16}O
	24	THURS			
	25	FRI			
	26	SAT			
	27	SUN			
		MON	DRACOULIS, FEWELL	1	^{16}O

14UD SCHEDULE - 31/5/79 - 29/6/79

MONTH	DATE	DAY	GROUP	LINE	
MAY	28	MON			
	29	TUES	PREVIOUS SCHEDULE		
	30	WED			
	31	THURS	ECK, LEIGH, OPHEL, CLARK	6	^9Be
JUNE	1	FRI			
	2	SAT			
	3	SUN	(possible detector tests)		
	4	MON	HAY, SODERBAUM, TREACY	7	I, Cs
	5	TUES			
	6	WED			
	7	THURS	NEWTON, GALSTER, SIE, LEIGH, HINDE	6	^{19}F
	8	FRI			
	9	SAT	(possible detector tests)		
	10	SUN			
	11	MON	LEIGH, NEWTON, SIE	5/6	Ti?
	12	TUES			
	13	WED	DRACOULIS	1	Be, B
	14	THURS	NURZYNSKI, HEBBARD, CLARK, ECK, OPHEL	5	^{16}O
	15	FRI			
	16	SAT			
	17	SUN			
	18	MON	Queen's Birthday Holiday		
	19	TUES	CLARK, ECK, HEBBARD, OPHEL, NURZYNSKI	5	^7Li
	20	WED			
	21	THURS	~~BAXTER ET AL.~~	~~5(6)~~	~~α~~
	22	FRI	ENGE TESTS		~~Lithex~~
	23	SAT	Lithex source out of action		
	24	SUN			
	25	MON	ECK, LEIGH, OPHEL, CLARK	6	^9Be
	26	TUES			
	27	WED	~~NURZYNSKI ET AL.~~	~~5~~	~~^{16}O, ^{24}Mg~~
	28	THURS	NURZYNSKI et al	5	^{16}O ^{24}Mg
	29	FRI			
	30	SAT			
JULY	1	SUN			
	2	MON	DIH		

SPRINGTIME 1979

28 MON
29 TUES
30 WED