AUSTRALIAN NATIONAL UNIVERSITY

DEPARTMENT OF NUCLEAR PHYSICS

14UD TANK OPENING REPORT NO.19

19th to 23rd November, 1979 (4 days open)

PREAMBLE:

The 14UD was last closed on August 23rd and for most of the 88 days until the recent opening, performance has been very good. A spark late in October was followed for a while by voltage instabilities attributed to a unit somewhere in the LE column. At about the same time stability was better without Chain 3 in use; later Chain 3 seemed exonerated and performance was better without Chain 1. All units in the LE column were shorted individually and stability was checked, in each case, with an analyzed beam of copper which happened to be running. The tests were inconclusive because more than one unit might have been faulty, but copper is a difficult beam to operate and, following careful readjustment of focusing and steering, stability improved somewhat. No further tests were made of the column and muttering was redirected to a combination of inept operation and Chain 1.

Early in November it was found that negative self-charge on Chain 1 could not be oiled away, and it was assumed the reservoir was empty. Report No.17, page 2 refers to this oiler as the most efficient, and the only one ever to run dry. Accordingly Chain 1 was left off whenever possible, partly because of instability but largely because dry chains lead to breakages (Report No.8, page 3).

Cracked foils:

At the last opening it was decided to try some cracked ethylene foils in the hope of prolonging foil life (Report No.18, page 3). With scant information and zero experience, 40 foils were made in a hurry and put in the first 40 forward positions. Their lifetimes were found to be much shorter than normal foils. The foilmaker held for as long as possible to his conviction that forward and reverse had mysteriously become interchanged, and then conceded defeat both gracefully and wistfully.

Terminal volts:

An analysis was made of terminal voltages used during the past year. The 14UD ran at greater than 12 MV for 43% of the time; greater than 13 MV for 19% and at 14 MV and above for 2.6%. In all cases up to about 13.5 MV these were the terminal voltages required, and, from 13.5 MV upwards, there were only a few instances of experimenters finding it necessary to run below their preference until the machine had conditioned.

Decision to open the tank:

The few foils left were of poor quality and there was trouble with the terminal reverse actuator. Machine stability had improved but was not inspiring confidence and Chain 1 was probably unsafe to use. The closeness of Christmas was the deciding factor and an opening was scheduled for terminal foil change and general service.

THE TANK OPENING

When the tank doors were opened there was a strong smell inside which was not usual. Entry was delayed for longer ventilation than usual because of it.

CHAINS:

Chain 1, and the rims of its pulleys, were very dry; however, the fault was due to a defective oiler and not an empty reservoir. Chains 2 and 3 were distinctly tacky, but moist enough to be acceptable; their pulley rims were moist without being tacky.

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All chains were thoroughly cleaned and then oiled by hand. Casting covers were taken off all castings with stabilizing idlers, and out of the 72 in use only one had poor bearings; no tyres were damaged. The ANU versions of bearing support fitted (Report No.14, page 2) in an attempt to extend idler bearing life, were in excellent condition. Spring contacts from two d.c. idlers were missing.

COLUMN:

In view of the instabilities considerable attention was paid to the column in a search for loose rings, stringers, dropped corona assemblies etc, but nothing of that nature was seen. There was a certain amount of dust on the castings, and posts and tube flanges but the amount was probably less than usual, and certainly not responsible for the instability. The characteristic brown stain was on the terminal, thicker than usual, but quite dry. The stains on the corona assemblies appeared not to have increased at all.

POINTS:

All were in good condition. All point assemblies, both tube and column, were removed from Unit 2 and replaced by old assemblies reconditioned at ANU by removing the old needles and fixing with Allstate solder new ones cut from sewing needles.

STRIPPERS:

The cause of sluggish foil changes, and halfway positions on the terminal foil counter, was attributed to the flexible Bowden cable between the Geneva mechanism and the counter. The linkage was converted to one consisting of two rigid shafts with connections by universal couplings. Pneumatic actuators were adjusted at both strippers.

The isolation valve in the terminal stripper leaked and had to be adjusted as occurred last time; after a simple adjustment the valve held. More difficulty was experienced than usual in removing the stripper housing. Because of delay in completing the manufacture and insertion of the new foils the assembly could not be put back for 48 hours, and tube pressures were watched carefully. HE pressure rose to 4×10^{-6} over the period.

Since the last closure foils made by precisely the same method as the unsatisfactory ones were found to be thicker than expected by about a factor of 5. This time it is believed that the cracked ethylene foils were really about 5 micrograms, and 40 of these were put in, together with 20 "baggy" carbon ones. The remainder were carbon made in the usual way.

When we attempted to put back the newly loaded foil assembly it was impossible to get the housing flange onto the 8 fixed studs. The studs had to be removed and bolts were used instead. It appears that distortion of the stud flange, or individual studs, was the cause of the problem. Assembly has gone smoothly on all previous occasions.

COLUMN METERING:

The charging current leads were in poor condition; two were rerouted and improved insulators fitted. The barrier strip on which the leads are connected was renewed because of accumulated spark damage.

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VACUUM SYSTEM:

We are plagued with leaky valves at almost all positions along the accelerator tube; however, because letting the tube up to atmospheric pressure introduces loss of conditioning, we prefer to suffer the leaks until an occasion when the tube has to be opened. Since the installation of the HE stripper in April 1978, (Report No.11, page 6), the tube has remained continually under high vacuum apart from when an iris and extra einzel were fitted at the LE end in March 1979 (Report No.15, page 2). On this occasion the LE ball valve leaked and the entire tube went to 50 microns, necessitating a complete 'let-up' to nitrogen.

The only valve known to be holding is the NEC fast valve, after the analyzing magnet, and the reason for this may well be that it closes unpredictably with such ferocity that no experienced gas molecule would care to approach it.

A source of much inconvenience has been the Source Room (Level 5) Isolation Valve which has to close against atmospheric pressure when the inflection magnet is turned from one source to the other. The valve has recently been removed three times by letting the tube up to argon as far as the leaky ball valve, putting on a blanking plate, then roughing and vacsorbing. On the last occasion the entire accelerator tube leaked slowly up to 1×10^{-4} torr while the work was being carried out. Beam burns on the valve flap, and damage to the viton O-ring, led us to fit a 1 inch aperture above the valve; however, the same effects were seen on this most recent occasion and the valve mechanism was adjusted in order to withdraw the flap further in its open position. Insufficient time has passed for a convincing test to be made.

ION SOURCES:

The lithex source is only used on the rare occasions when helium beams are required. It performs well and has been trouble-free.

The sputter source operates very reliably and rarely requires service beyond a cleanup when cones are changed. A second frit blocked as a result of the source being driven too hard and there was consequent erosion of the molybdenum suppressor electrode. A new electrode was put in and the suppressor volts increased by about 30%. Erosion on the new electrode is considerably less after time comparable to that which has revealed erosion in the past.

GAS HANDLING:

A filter in the gas dryer circuit was found to have been deformed, possibly by recirculation when the reactivated alumina was too hot. This is assumed to relate to the initial smell and dirtier conditions in the tank.

CLEANING:

Inevitably the column was blown with nitrogen and cleaned with tac-rags.

CHARGING TESTS:

The chains ran evenly during their mechanical tests and no adjustments of counterweights were necessary. When volts were run up all chains displayed copybook charging currents.

PERFORMANCE:

When the tank was at 60 psia volts were run up to 10 MV. All currents

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were beautifully steady. The machine was put into use immediately full tank pressure was reached and operated at the required voltage of 12.5 MV. Eerie stability, even superb eerie stability, was apparent. At the time of writing the 14UD has run non-stop under these conditions for 4 days and nights.

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VALE TANDEM NOSTRA REGINA

We report, with much regret, that the EN tandem was closed down irrevocably on November 20th after 93,470 glorious hours.

The Grand Old Lady arrived as a provocative, nubile maiden in October MCMLX, and was met by our highest ranking dignitary, Sir Ernest Titterton himself, who personally undertook to conduct her progress through the narrow corridors to her chamber, and bed her down, directing the entire colourful retinue with a courtliness that remains in our memories.

Countless experiments were performed on the tandem which was rarely off the air, apart from routine maintenance and modifications. For nearly twenty years visitors came from overseas to use the tandem and there were many students who spent happy nights attending her while their less fortunate supervisors tossed restlessly in bed. Those of us who remember her youth, and their own, are very sa

T.A. BRINKLEY

November 29th, 1979.

David Weisser is at Oak Ridge and is due to return to Canberra in January.

14UD SCHEDULE - 7/11/79 - 12/12/79

MONTH	DATE	DAY	GROUP	LINE	
		MON			
		TUES			
NOV.	7	WED	DRACOULIS ET AL.	2	α
	8	THURS	HINDE ET AL	6	^{28}Si
	9	FRI			160 MeV
	10	SAT			
	11	SUN			
	12	MON	HAY ET AL	7	^{63}Cu
	13	TUES			(100 MeV)
	14	WED	~~LEIGH & OPHEL~~ Detector tests		
	15	THURS	~~DETECTOR TESTS~~	5	
	16	FRI	NEWTON et. al.	6	^{30}Si
	17	SAT	↓		
	18	SUN			
	19	MON	~~GAS OUT. DOORS open~~	3 pm	
	20	TUES	TANK OPENING		
	21	WED			
	22	THURS	NEW FOILS ETC.		
	23	FRI			
	24	SAT	GAS UP VOLTAGE TESTS		
	25	SUN	↑ DRACOULIS		
	26	MON	DRACOULIS, FAHLANDER	1/2	^{16}O

14UD SCHEDULE - 1/10/79 - 6/11/79

MONTH	DATE	DAY	GROUP	LINE	
OCT	1	MON			
	2	TUES	LEIGH & OPHEL	5	^{16}O
	3	WED	DETECTOR TESTS		
	4	THURS	FAHLANDER, FEWELL, DRACOULIS	1/2	^{16}O
	5	FRI			
	6	SAT			
	7	SUN			
	8	MON	NURZYNSKI, HEBBARD, CLARK & OPHEL	5	^{16}O
	9	TUES			
	10	WED			
	11	THURS	SODERBAUM, TREACY, HAY, PENDER	7	^{63}Cu
	12	FRI			
	13	SAT	LEIGH. Detector Tests	5	^{16}O
	14	SUN			
	15	MON	POLETTI, DRACOULIS, FEWELL, FAHLANDER	1/2	^{16}O + B^{10} B^{11}
	16	TUES			
	17	WED			
	18	THURS			
	19	FRI	BAXTER ET AL.	5	α
	20	SAT			
	21	SUN			
	22	MON	CLARK, ATWOOD, HEBBARD, NURZYNSKI, OPHEL	5	^{7}Li
	23	TUES			
	24	WED	SIE ET AL	1	^{19}F
	25	THURS			
	26	FRI	CLARK, ATWOOD, OPHEL	5	^{18}O
	27	SAT			
	28	SUN			
	29	MON			
	30	TUES	SODERBAUM, TREACY, HAY, PENDER	7	^{63}Cu
	31	WED			
NOV	1	THURS	HINDE ET AL	6	^{28}Si
	2	FRI			
	3	SAT			
	4	SUN			
	5	MON	DRACOULIS, ATWOOD, FAHLANDER, LEIGH	1/2	^{32}S, ^{28}Si + α
	6	TUES	Swing inflector magnet. ↓ α		
		WED			
		THURS			
		FRI			

14UD SCHEDULE - 27/8/79 - 29/9/79

MONTH	DATE	DAY	GROUP	LINE	
AUG.	27	MON	DRACOULIS & ATWOOD	1	$^{9}Be, ^{12}C, ^{16}O$
	28	TUES			
	29	WED	TAKAHASHI ET AL	5	^{10}B
	30	THURS			
	31	FRI	NURZYNSKI ET AL	5	^{16}O
SEPT.	1	SAT			
	2	SUN			
	3	MON	NEWTON ET AL	6	^{19}F
	4	TUES			
	5	WED	LEIGH ET AL Target Tests	1	^{58}Ni
	6	THURS	TAKAHASHI ET AL	5	^{14}N
	7	FRI			
	8	SAT			
	9	SUN			
	10	MON	LEIGH ET AL	6	$^{58}Ni, ^{28}Si$
	11	TUES	SODERBAUM ET AL	7	Cu
	12	WED			
	13	THURS	BAXTER ET AL	5	α
	14	FRI			
	15	SAT			
	16	SUN			
	17	MON	SODERBAUM ET AL Rods out	7	Cu
	18	TUES			
	19	WED	LEIGH ET AL	1	^{58}Ni
	20	THURS			
	21	FRI			
	22	SAT			
	23	SUN	NURZYNSKI ET AL	5	^{32}S Si
	24	MON			
	25	TUES			
	26	WED	FEWELL ET AL	5,6	$^{10}B, ^{11}B, ^{30}Si$
	27	THURS			
	28	FRI			
	29	SAT			
		SUN			
		MON			