NEW UPGRADATIONS FOR 15 UD PELLETRON ACCELERATOR AT IUAC, NEW DELHI

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Abstract

Several major modifications were performed for up gradation of 15 UD Pelletron accelerator since its commissioning. Recently, two numbers of new 50 position stripper foil assemblies were installed in high energy section. A new chiller system, for SF_6 gas inside accelerator tank, is designed and installed outside accelerator tank. One out of two of the charging chains, has completed 1,00,000 hours of operation. A major maintenance work for charging system was also performed recently. Other up gradations which enhanced the performance of accelerator are foil stripper position read back, area interlocking for proton beam runs. Recent up gradations & other important activities for the Pelletron accelerator are being reported in the present paper.

INTRODUCTION

15 UD Pelletron accelerator [1], in Inter University Accelerator Centre, is operating satisfactorily since 1990. Machine up time better than 90% and with beam on target time better than 50% is achieved. Regular maintenance and number of up gradations were done for continuous operational enhancement of machine. Apart from the development work for new chiller system and two newly installed foil stripper assemblies, other up gradation work such as foil stripper position read back and area interlocking for proton beam runs were done. Major maintenance work was done for better charging system and hence stable beam was also carried out.

FOIL STRIPPER ASSEMBLIES

Two numbers of 50 positions foil stripper assemblies were installed, one before analyzer magnet and another in vault after analyzer magnet. Foil stripper before analyzer magnet will be used to get higher charge states in order to achieve higher energy boost from LINAC. The foil stripper in vault reduces ME/Z^2 by increasing the charge state after acceleration and hence will help to switch the beam to low ME/Z^2 beam lines. This also helps to deliver higher charge states to users in different experimental lines. These foil stripper assemblies were procured from NEC, USA and their controllers were developed in house.

Foil stripper controller

Two controllers of similar design were developed and installed to control the operation of newly installed foil stripper assemblies. These controllers can control the movement of foil strippers either locally or remotely from control room. CAMAC crate was modified for remote control. New foil stripper position read back is also incorporated in these controllers. Once the increment or decrement command is given to this controller (either locally or remotely), it will accordingly increment or decrement the position of foil stripper and also generates position read signals which can be read in control room. Both of these controllers are working satisfactorily. The schematic foil stripper controller is shown in figure 1.

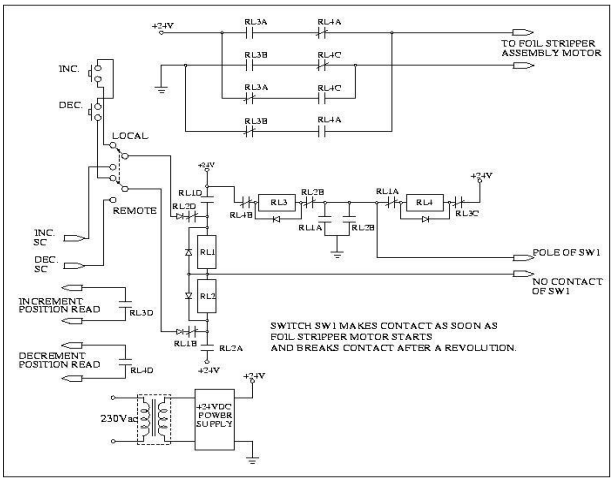

Fig. 1. Foil stripper controller.

New foil stripper position read back

Foil strippers plays an important role in the operation of tandem accelerator. For good beam transmission, it is essential to ensure the condition of foil stripper in use is good. The original position read back system came along with machine could not able to give exact position read of stripper in use. A position read back system was then designed by using a 3 digit BCD UP/DOWN counter with a DAC. Although this new read back system worked fine, it had problem of jumping in position read during tank spark at higher terminal potential. Hence, another new read back system was designed. In this design, foil stripper controller generates individual contact closure for each increment and decrement change of foil stripper at the CAMC input gate module. This module will generate TTL pulse and is then counted by a software UP/DOWN counter accordingly and displays foil stripper position on control console. This foil stripper position read is installed for all four stripper foil assemblies and it gives stripper position read precisely. This development helps a lot in operation. It also helped in comparative study of life time foil stripper prepared by different technique. Block diagram for position read back is shown in figure 2.

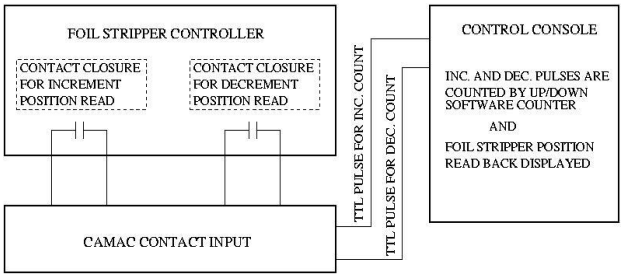

Fig.2. Block diagram for stripper position read.

SF_6 CHILLER

A chiller was used inside accelerator tank to regulate the SF_6 temperature inside tank at around 25 degree C. This chiller was quite old (~15 years) and housed inside tank. It is planned to replace this by a new one which can be housed outside accelerator tank in order to avoid any kind of accident which may occur during the operation of accelerator. A SF_6 chiller for this purpose is designed for a heat load of 16500 kcal/hr and fabricated by a local vendor. This new chiller is of shell and tube type. Chilled water will be circulated in the tube which will cool SF_6 gas present in shell. After proper inspection chiller was installed outside PAT. The performance of this new chiller is quite satisfactory. This new chiller is shown in figure 3.

Fig.3. New SF_6 Chiller.

INTERLOCKING FOR PROTON RUNS

To take care the radiation hazards during Proton beam run, the area interlocking system was modified. The modified interlocking system recognizes the presence of proton beam by generating a signal after reading the field value of mass analyzer magnet. Once the proton beam is recognized, the entire accelerator area and beam hall has to be interlocked for the beam transmission from pre acceleration section up to the experimental chamber. If any of the area interlocks fails, the proton beam will be stopped by a faraday cup in pre acceleration section. The absence of signal ensures normal interlocking conditions, in which beam stops at pre-acceleration cup if any NLK in low energy and high energy fails and stops at vault cup if NLK of current experimental line fails.

CHARGING SYSTEM MAINTENANCE

During the normal operation of Pelletron, instability was observed in charging system. Maximum fluctuation of around 8 μA was observed in 20 μA of charging current for charging system #2. After detailed investigation, it was found that the fluctuations was due to the snapping in chain #2. Alignment and bearings of charging system #2 were in good condition. To take care of snapping of chain, a pellet from chain #2 was removed and few counter weights from its see saw mechanism were adjusted for proper alignment of chain. After maintenance, fluctuation in charging current had reduced to very low value and it worked well during routine operation. Removing of pellet is shown in figure 4.

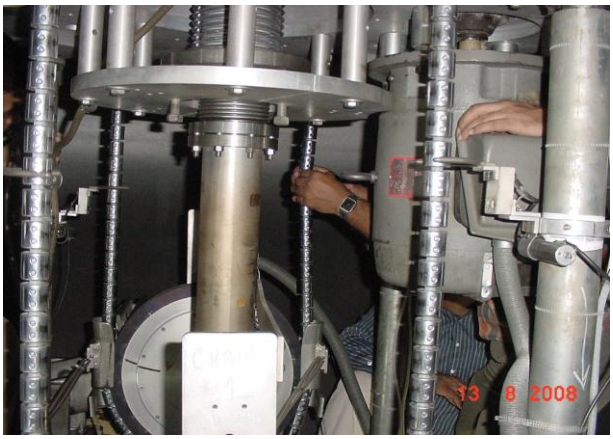

Fig.4. Removing a pellet from chain #2.

REFERENCE

[1] D.Kanjilal, S.Chopra, M M Narayanan,I S Iyer, V Jha, R Joshi and S K Datta, Nucl. Instr. & Methods A328 (1993)97