1. ACCELERATOR

1.1 OPERATIONAL SUMMARY

S Chopra

The accelerator operation in this year had been mainly smooth. Only major breakdown was due to fiber optic cables problem in the accelerator tank. The accelerator tank was opened for the maintenance of fiber optic cable. Overall maintenance of machine was also carried out. The details are mentioned in the maintenance section. The operational summary of the accelerator is as follows for the period 02-04-2005 to 31-03-2006.

Total no. of Chain Hours	=	6372 Hours
Total Beam utilization	=	3767 Hours
Machine breakdown	=	0283 Hours
Accelerator Conditioning	=	2313 Hours
Beam Change Time	=	0009 Hours

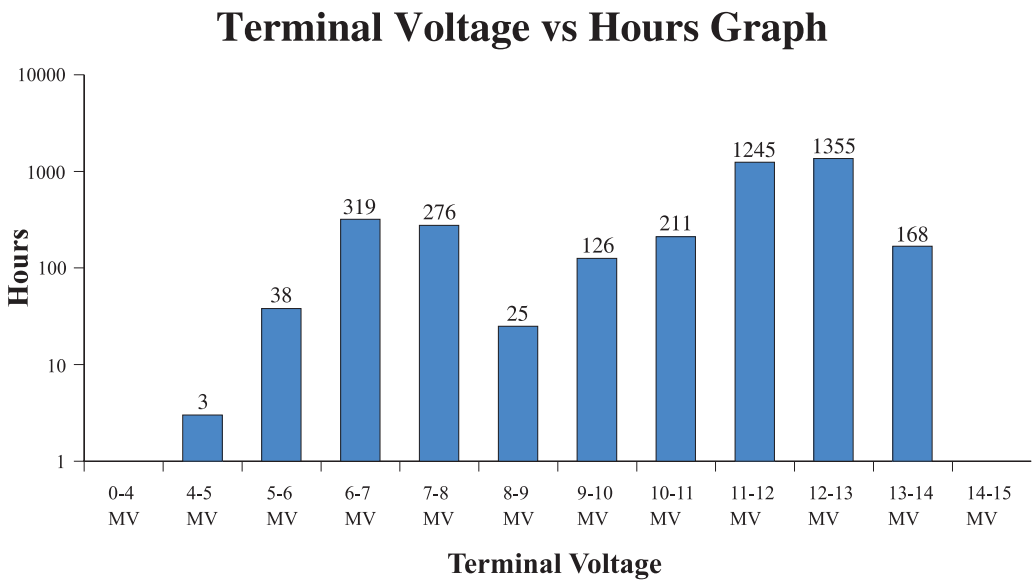

Fig. 1. Terminal voltage vs Hour curve

During the above mentioned period, a total number of 471 shifts was used for experiment. Out of these 471 shifts, 68 shifts were used for pulsed beam users. The machine uptime for this period is 95.56% and the beam utilization is 59.11%. The voltage distribution of the Terminal Potential used for different experiments in the year is shown in above Graph. The maximum voltage achieved during conditioning in this year was 14.2 MV.

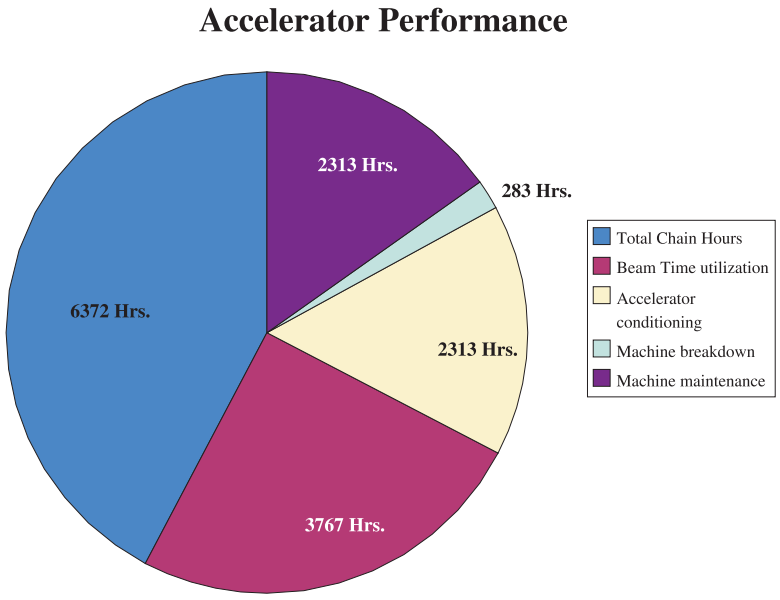

Fig. 2. Accelerator performance, in the form of Pi-chart

The total duration of beam run for the mentioned period is 3767 hrs. Duration of run time in percentage for different ions is shown as below.

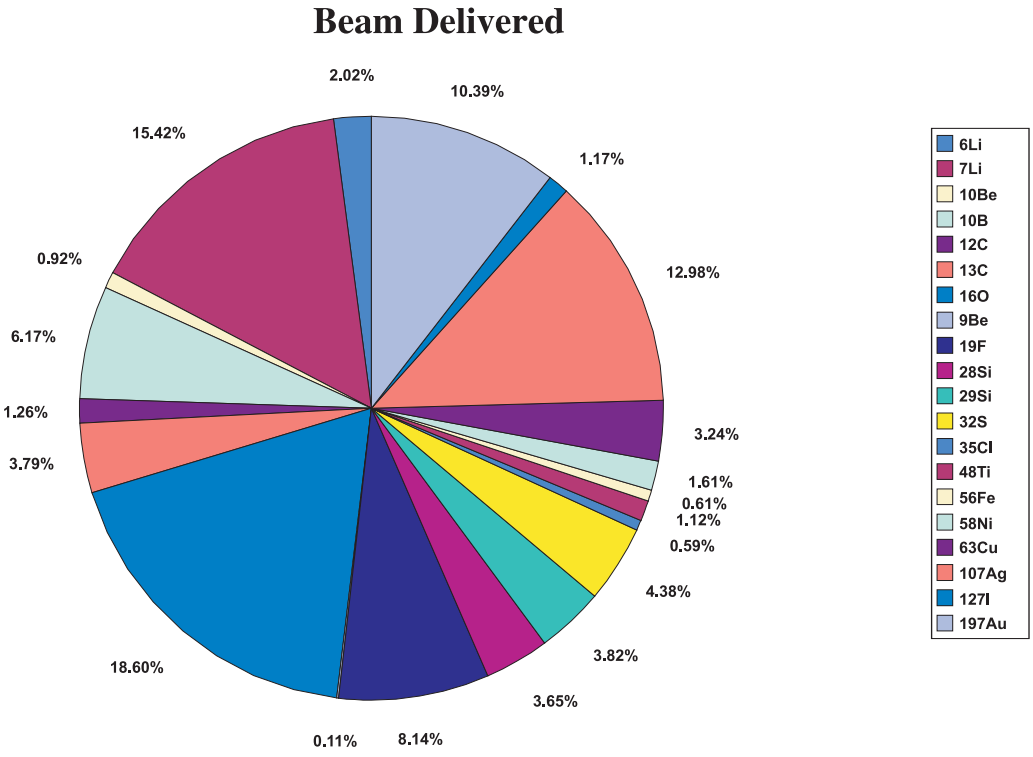

Fig. 3. Run Time for different ions (2005-2006)

1.2 MAINTENANCE AND DEVELOPMENT ACTIVITIES

S Chopra, R Joshi, S Gargari, M Sota, V P Patel, S Ojha, K Devarani, R P Sharma, J Prasad, R Kumar, M P Singh, N S Panwar, S Mohan, Suraj Kumar, Pranav Singh, P Barua and A Kothari

There were two scheduled and four unscheduled tank opening maintenance from April 2005 to March 2006. The first schedule maintenance was from 15th July 2005 to 10th August 2005 and the second one was from 24th January 2006 to 27th February 2006. The first maintenance was taken up after duration of seven months of operation. In these scheduled maintenance, routine maintenance like checking of resistor network inside tank, HV breakdown test of CSP gaps, foil stripper change etc. were carried out. Apart from these jobs few major maintenance work were also performed, which are listed below.

Major maintenance jobs during scheduled tank openings

The major maintenance jobs carried are listed below :

1. Charging system maintenance

Both the charging systems were operated and thoroughly checked. Neither of the chains was touching the idler wheels at the time of starting and they were not touching any of the idler wheels during running either but they were touching a few of the idler wheels at the time of stopping. Idler dust was getting generated from three places, in unit #18, 22 and 27 in the case of chain #2. The amount of dust was maximum in unit #27, a little less in unit #18, and in unit #22 it was very little. In case of chain #1 the idler dust was getting generated in only unit #22 and the amount of dust, in this case, was very little. Both the chain motors bearings were checked before starting the charging system maintenance. The condition of the chain motor bearings, of chain #2, was found to be fine. Bearings of chain motor #1 was showing more vibrations as compared to chain motor #2. Presently there is no need to replace their bearings. Both the charging chains were kept ON for several nights and, after each overnight running of chains, the condition of both charging systems was checked thoroughly. Some other problems were observed which were rectified to get trouble free operation of charging system. Some pick off wheel and pulley dust was found in unit #16. A broken insulator cap of alignment bolt of pillow block of charging chain #2 on the downcharge side of terminal, one insulator sleeve of pillow block mounting bolt on upcharge side and one on downcharge side for charging chain #1 were replaced by in-house fabricated ones. One of the idler wheel on the downcharge side of charging chain #2 was replaced by a new one. Both the charging systems were kept ON overnight. The doubler pick off wheel of charging chain #1 was replaced by

a new one and both the pulleys were oiled. The alignment of all pick off wheels and condition of pulleys were found to be satisfactory. There was no dust from either of the pulleys. For the last few last overnight running of both charging systems, both were found to be absolutely clean.

2. Rotating Shafts bearing maintenance

Maintenance of the rotating parts of the accelerator is a routine job and is one of the major maintenance works. Total number of twenty five separator boxes, thirteen in low energy side and twelve in high energy side, were opened for maintenance. Bearings of all these separator boxes were replaced as all of them were bad.

3. Unit repairing

The resistor value across gap #16 in unit #15 was found to be low. Column support post P-4 has some cracks across gap #15 and its resistance was measured to be 5 Giga ohms. This gap was electrically shorted in order to save this post from further damage.

4. Column Support post change

There were severe cracks across the gap #15 of P-4 in unit #11. This made the post P-4 mechanically week. Hence, this column support post was replaced by a new one.

5. Ion pump related maintenance

There was no pressure readback from one of the terminal ion pumps (IP T-2). The readback PCB of ion pump controller was changed to rectify the problem. In another incident ion pump IP T-1 got operated while loading the stripper foils at terminal by accident. This faulty IP T-1 was replaced by a recycled ion pump. This newly installed ion pump was tested and it worked fine.

6. Gas stripper maintenance

During the operation it was observed that gas stripper valve was moving in reverse direction i.e. the valve was closing when the opening command was given and opening when closing command was given. After a few operations, this valve was not operating at all. The self starting capacitor (0.068 μf) of gas stripper valve motor had to be replaced to solve the problem.

7. Replacement of hoop screws

Replacement of hoop screws is now considered to be a routine maintenance job. Lots of hoop screws were changed. These hoop screws developed resistance between screw head and equipotential rings due to some deposition on the threads of hoop screws.

Maintenance jobs during scheduled tank openings

1) First unscheduled tank opening maintenance took place in August 2005. Charging power supply was fluctuating and was not able to charge the terminal. Cause for this problem was the overlapping of +50 kV and -50 kV vardex cables inside tank. The routing of these cables was rearranged to solve the problem.

2) Second unscheduled tank opening maintenance took place in September 2005. Gas stripper was not working. The problem was located in the gas stripper controller. The valve controller PCB got burnt. This PCB was rebuilt and tested. The working of gas stripper controller was satisfactory after this repair.

3) Third unscheduled tank opening maintenance took place in March 2006. Fiber optic cables, used to carry the control signals for terminal and high energy dead section devices, got damaged at unit #22 after a spark. This spark was at 12.4 MV. Entire fiber optic cable bunch was replaced by a new bunch. This rectified the problem of controlling of devices housed in terminal and high energy dead section.

4) Fourth unscheduled tank opening maintenance also took place in March 2006 after a week of tank closing. Again the same fiber optic cables bunch got damaged and machine sparked at 11.6 MV. This time fiber optic cables were damaged at unit #29 and 30. As there was no spare fiber cables bunch available, in-house developed fiber optic cable splicers (connectors) were used to join the entire bunch to solve the problem.

Other development activities

1. Modification in foil stripper position readback

R Joshi, M Sota, S Ojha and V P Patel

A new foil stripper position readback system was developed and installed as the old position readback, which came alongwith the machine, had problem of false

position readout. Although this new readback system worked fine, it has a problem of erroneous position readout during tank spark. Hence, this new readback system was modified. In this modification, foil stripper at terminal generates individual pulses for each increment and decrement change of foil stripper. These pulses are then counted by a software UP/DOWN counter which displays foil stripper position on control console. This modified foil stripper position read is installed and is working fine without any jump in position readout during spark.

2. New interlocking for proton beam

R Joshi, S Ojha and Birendra Singh

A new interlocking system exclusively for Proton beam run was designed, fabricated and installed. This interlock system recognizes the presence of proton beam by reading the field value of mass analyzer magnet (injector 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 upto the experimental chamber. If any of the area interlocks break, the proton beam will be stopped by a faraday cup in pre acceleration section (FC 02-1). The proton beam run can cause high risk of neutron radiation, which is quite harmful. Therefore it is important to take care of human health hazard which can be caused due to proton beam. This proton beam interlocking system has been used in one of the proton beam runs and it worked successfully.

1.3 ION SOURCE ACTIVITIES

S Chopra, R Joshi, S Gargari, M Sota, V P Patel, S Ojha, K Devarani, R P Sharma, J Prasad, R Kumar, M P Singh, N S Panwar, S Mohan, Suraj Kumar, Pranav Singh, P Barua and A Kothari

The ion source operation was smooth from April 2005 to March 2006 with very few operational problems. These operational problems were rectified during maintenance. The major maintenances performed are given below.

Maintenance work

1. General Purpose Tube (GP tube) conditioning

All five General purpose tubes were cleaned thoroughly with alcohol and then it was conditioned. During conditioning X-ray activity was monitored in area

monitor. The radiation was going as high as 2.5 mr/hr. After proper conditioning, now the General purpose tube is holding upto 350 kV.

2. MC-SNICS Ion source maintenance

The source was opened for maintenance during both scheduled tank opening maintenance (July 2005 and February 2006). The source was totally disassembled. Each and every part of source was sand blasted and properly cleaned. After thorough cleaning work the source was reassembled back and aligned. Before the January 2006 tank opening maintenance, it was observed that focus element of einzel lens was not holding voltage beyond 1 kV. This restricted the optimum transmission of beam from source. To solve this problem the entire einzel lens was replaced by spare lens in February 2006. 5 grams of fresh cesium was also loaded in the cesium reservoir in February 2006. Cathode wheel of MC-SNICS was loaded with required cathodes for 16 times from April 2005 to March 2006. The maximum beam current achieved from this source was 40 microampere (^{28} Si beam).

Ion Source Test Bench facility

An electrostatic quadrupole and an electrostatic steerer was developed and fabricated in-house. These quadrupole and steerer were installed in the ion source test bench after the mass analyzer magnet. This is done to improve the beam optics after the magnet. This quadrupole can be used in triplet as well as doublet configuration. A double slit was also installed between beam profile monitor and faraday cup before mass analyzer magnet. During installation, alignment of line was also checked. Apart from this, a recycled ion pump was installed in the line as the old ion pump went bad and was not pumping.

1.4 BEAM PULSING SYSTEM

R Joshi, S Ojha and A Sarkar

Operation

Pulsed beam was delivered to user for a total of 544 hours. The beams bunched for these pulsed beam runs were ^{16}O and ^{19}F. Multi harmonic buncher is presently being used for all the pulsed beam runs. 4 Mhz. chopper in pre acceleration section was used to eliminate the dark current as the repetition rate required by user was 250 ns. Traveling wave deflector (TWD) was also used, along with chopper and multi harmonic buncher, to get different repetition rates other than 250 ns. All

components of beam pulsing system worked satisfactorily for all experiments.

1.5 ACCELERATOR MASS SPECTROMETRY (AMS)

Pankaj Kumar, K.S. Golda, Devarani Devi, S. Ojha, S. Gargari, R. Joshi, T. Nandi, A. Mandal, S. Chopra, and S.K. Datta

AMS facility development work has continued this year as before. Progresses made in development are reported below. This year major efforts were made towards the ^{10}Be detection and we got success in detecting ^{10}Be from Standard and geological Mn nodule samples. In the stable isotope AMS work we did depth profiling of ^{63}Cu in Si substrate

1.5.1 Detection of ^{10}Be from Standard SRM 4325 Sample

Pankaj Kumar, J.K. Pattanaik[1], K.S. Golda, Devarani Devi, S. Ojha, S. Gargari, R. Joshi, T. Nandi, A. Mandal, S. Chopra and S.K. Datta

[1]Pondichery Central University, Pondichery 605014

This year we took the final steps in ^{10}Be AMS facility development and in May 2005 we succeeded in detecting ^{10}Be from standard sample SRM 4325. In the measurement, simultaneous injection method was used by injecting mass 26, consisting mainly of $^{10}Be^{16}O$, $^{9}Be^{17}O$ and $^{9}Be^{16}OH$. Maximum $^{9}Be^{16}O$ current (mass 25) extracted from ion source was found to be 1.1uA. $^{10}B^{3+}$ beam (from injected mass 26 as $^{10}B^{16}O$ from a Boron cathode) was used as a pilot beam for tuning $^{10}Be^{3+}$. At the terminal, combination of gas and foil stripper was used and a maximum transmission of 19% with injected $^{9}Be^{16}O^{-}$, and $^{9}Be^{3+}$ current was achieved after analyser magnet at terminal potential of 11MV. $^{17}O^{5+}$ (from $^{9}Be^{17}O$) was collected in the offset Faraday cup with simultaneous recording of ^{10}Be counts in the MAGIC detector at 30mbar pressure of isobutane. This method works because the $^{17}O^{5+}$, & $^{10}Be^{3+}$ has very close magnetic rigidity (matching within 1.1%) for terminal potential 10-12MV. For stopping ^{10}B in the gas cell absorber, 220 mbar pressure of Nitrogen was used. This is necessary because ^{10}B signal was about a million times stronger than ^{10}Be. Multi Anode Gas Ionization Chamber (MAGIC) has five anodes and one surface barrier detector at the end but for ^{10}Be detection it was used in the DE-E_{res} mode using all anodes shorted to give one DE signal and the surface barrier signal as $E_{res.}$ Fig.1 shows the 2D spectrum obtained from MAGIC detector, with dE plotted against E_{res}.

In the spectrum ^{7}Be and some alpha is probably due to ^{10}B (p, α) ^{7Be} reaction happening at the front Myler foil of gas cell absorber. Much of alpha also comes from

fusion reaction of ^{10}B on nitrogen gas. ^{9}Be signal in the spectrum is due to ^{9}Be (from $^{9}Be^{16}OH$) stripping anywhere in the machine and entering the detector by matching analyser magnetic rigidity. It can be eliminated by Wien filter. Data was taken for ~ 2hours for one cathode with injected $^{9}Be^{16}O$ current ~300nA. Result agrees to within 5-10% of known measured value $2.68x10^{-11}$for SRM 4325.

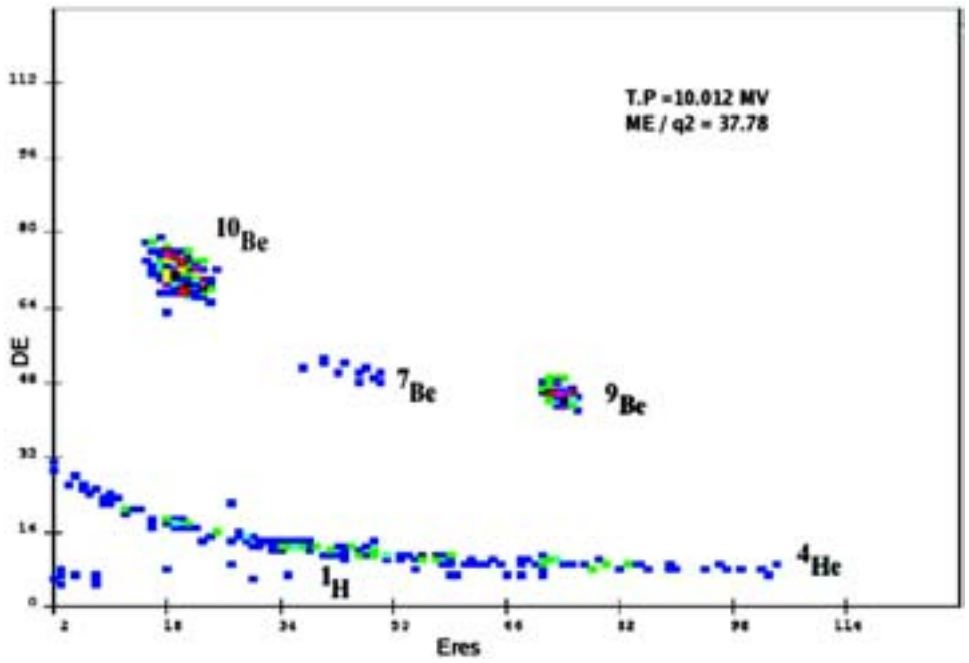

Fig. 1. Two Dimensional spectrum of ^{10}Be measurement from standard sample obtained from MAGIC

1.5.2 ^{10}Be detection from Mn nodules Geological sample

J.K. Pattanaik[1], Pankaj Kumar, K.S. Golda, Sunil Ojha, S. Gargari, R. Joshi, T. Nandi, S. Chopra, S. Balakrishnan[1] and S.K. Datta

[1]Pondichery Central University, Pondichery – 605014

^{10}Be AMS samples from Mn nodule were prepared in the chemistry lab of Dept. of Earth sciences, Pondichery Central University, Pondichery. Manganese Nodules are small poly-metallic deposits that exist in the deep ocean. These nodules occur in the form of encrustation, in irregular spheroidal / ellipsoidal shape, with diameter ~1 to 5cm, found in the top ~ 50 cm of the sediment pile of deep ocean. They contain a relatively high percentage of metals like Mn, Fe, Cu, Co and other base metals. So, it is also known as ferro- manganese or poly-metallic nodules. Core of the Nodules may be a shark teeth, Whale bone, meteorite fragments, basalt pieces etc. These crusts grow by direct precipitation of metal oxides dissolved in sea

water with other elements. ^{10}Be also co-precipitate with other elements from sea water. One of the most important applications of the ^{10}Be measurement using AMS, is to determine the growth rates of Mn-nodules, which is a very good recorder of sea water and paleo-oceanographic information over the last several million years. The half-life of the ^{10}Be ($T_{1/2}$ = 1.5 Ma), which is of the same order as the growth time needed for a few mm of manganese nodules material, makes it a very useful tool. Growth rate of nodules are very useful in providing clues to the origin and occurrence of these deposits, paleo-ocean water chemistry/oceanography, the Earth's magnetic field and cosmic ray intensity variation, paleo-events taking place in the ocean, on the earth and in interplanetary space, record of Quaternary climatic fluctuations, evolution of bottom water sources and deep water circulation patterns of the past. So these nodules are extensively used for studying ocean history.

In the measurement of ^{10}Be from Mn sample all the old set of accelerator parameters for studying SRM 4325 were used. Fig.2 Shows 2D spectrum of ^{10}Be measurement from Mn Nodules sample. In the sample ^{10}Be/ ^{9}Be ratio was found to be 7 x 10^{-11}, within error of ~10%.

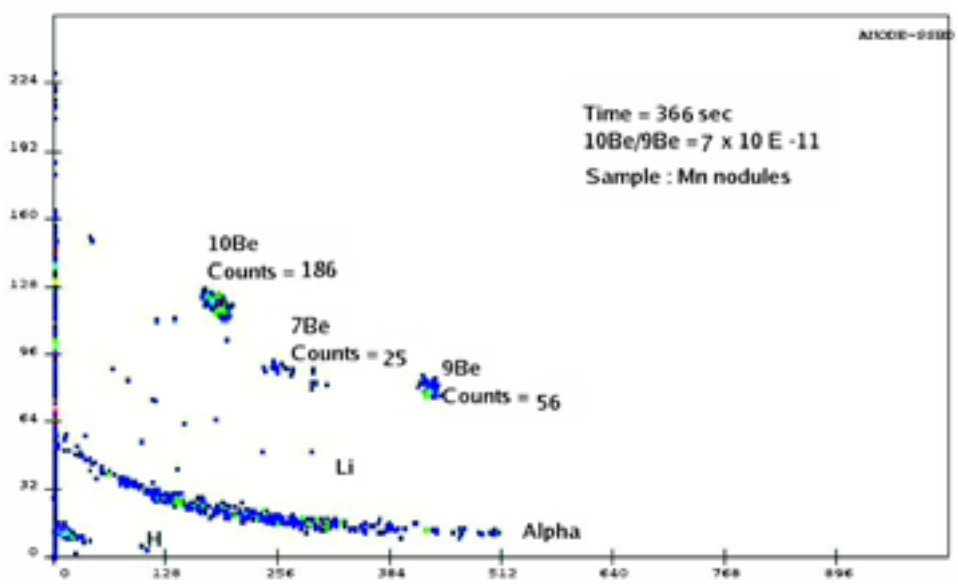

Fig. 2 Two Dimensional spectrum of ^{10}Be measurement from Mn Nodules

1.5.3 Stable isotope AMS – Depth profiling of ^{63}Cu in Si Substrate

S. Chopra, Pankaj Kumar, K.S. Golda, S. Ojha, S. Gargari, R. Joshi, D. Kanjilal and S.K. Datta

Samples were prepared using ECR (Electron Cyclotron Resonance) based Low Energy Ion Beam Facility (LEIBF) at IUAC. ^{63}Cu ions of fluence 3 X 10^{14} ions/

cm^2 and 3 $x10^{11}$ ions/cm^2 were implanted on Si wafer at 550 keV and 150 keV. These implanted Si wafers have been used as a cathode of the Ion source (MC-SNICS) and layer by layer materials from the sample is removed by Cs^+ sputtering. After the energy acceleration and selection of ^{63}Cu beam, it was put in the gas detector at 45mbar iso-butane gas. For timing information signal is given from precision Pulse generator 419 to the Preamplifier. Online recording of data was done using FREEDOM software.

Analysis of list mode data files is done using locally developed software INGASORT and other programs, which can give Cu counts/sec with respect to the running time. Cu implanted ions at 150 keV and 550 keV respectively for 3 X 10^{14} ions/cm^2 were studied.

The implanted wafers were also annealed at 500^0C and these annealed samples were also analysed for depth profile with time. The depth profile shows out-diffusion of Cu ions after annealing and study confirms the theory.

1.5.4 BeO sample preparation from Mn Nodules

J.K. Pattanaik[1], Pankaj Kumar and S. Balakrishnan[1]

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^{10}Be AMS samples from Mn nodule were prepared twice in the ultra-clean chemistry lab of Dept. of Earth sciences, Pondichery Central University, Pondichery. Since Mn nodules have many impurities, the separation of ^{10}Be from other matrix elements is essential to increases ionization efficiency and to lower the isobaric and other interferences during measurement. Organic matters and clay were separated by cold digestion i.e. mixing of sample with cold HCl and H_2O_2. Undigested silica and other impurities were discarded by filtration. After this ^9Be carrier was added. For Mn separation, solution was mixed with $NaBrO_3$ and hot conc. HNO_3. 20ml Bio-rad column filled with 15ml Anion exchange resin was used for separating Fe using 6N and 1.2N HCl and 20ml Bio-rad column filled with 15ml cation exchange resin was used for separating other elements like Mg, Co, Ti etc. from Be. On drying the solution by heating, yielded Be in $BeCl_2$ form. $BeCl_2$ was converted in $Be(OH)_2$ (ppt.) form after adding NH_3 and H_2O. Then it was put in Centrifuge, and was washed several times with water. The heating of precipitate upto 900^oC gave BeO. Finally Ag/ Nb powder was mixed to enhance thermal conductivity in the BeO powder and then this mixture was loaded in cathode capsules. This chemical separation procedure was calibrated by analysis of products of each procedure using an ICP-AES.

1.5.5 Conversion of NaCl in AgCl sample

Pankaj Kumar, J. K. Pattanaik[1], S. Balakrishnan[1]

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^{36}Cl standard samples in NaCl form, were procured from NIST, USA. To test the effectiveness of chemical procedure we converted ordinary but pure NaCl in AgCl form . 10 ml 1% NaCl solution was taken and mixed with excess amount of 1% AgCl, which gives AgCl (ppt.). Since AgCl is photochemically active so ppt. was stored in a tube which was wrapped with black tape. We left solution for overnight for ppt. to form and settle. Then it was centrifuged, washed with deionized water and dried up to 100^0C after wrapping centrifuge tube with aluminum foil to get AgCl in powder form. These samples will be put in the ion source to get ^{35}Cl and ^{37}Cl currents and to do comparison with ^{35}Cl and ^{37}Cl currents from ordinary AgCl powder.

1.5.6 Origin of Spurious Ions in AMS Spectra

T. Nandi

During the detection of radioisotopes many stable isotopes show up as spurious peaks in the AMS spectra using tandem accelerator. They may be originating from: 1. different charge-states of ion-beam appearing due to electron capture and loss in the second stage of acceleration, 2. hydrides of lighter isotopes and even some molecules, having the same injector magnet rigidity, may strip at the stripper to form various charge states which may match all beam optical parameters to reach the detector. In all these effects, charge changing process takes place at the stripper as well as at the second stage of acceleration [1], and even up to the analyzer magnet. The origin of all the observed spurious ions is remaining unexplained with these processes. We consider a physical process called electron detachment occurring in the first stage of acceleration which can explain most of the spurious ions remained unexplained yet. In this work we study the effect of electron detachment process in context of the ^{14}C and ^{36}Cl measurements.

It has been observed that the ^{12}C and ^{13}C peaks originating from different charged states are shown up in the $^{14}C^{q+}$ spectrum. Interestingly when measurements are carried out at the smaller machines (up to 8MV terminal) with lower projectile energy, ^{12}C and ^{13}C appear in both the sides of $^{14}C^{q+}$ the peak, whereas they exist in the low energy side only at the measurements with higher beam energies using a bigger accelerator. Now, beam energy required for $^{12}C^{q+}$ and $^{13}C^{q+}$ in matching the

magnetic rigidity of the $^{14}C^{q+}$ will only be possible if $^{12}C^{(q+1)+}$ and $^{13}C^{(q+1)+}$ capture an electron in the second stage of acceleration (q< z, atomic number). Electron capture cross section is inversely proportional to sixth power of E_k (E_k is kinetic energy of the projectile) and hence $^{12}C^{q+}$ and $^{13}C^{q+}$, produced due to electron capture process, have not been observed at higher beam energies. Therefore, ^{12}C and ^{13}C with lower energy than $^{14}C^{q+}$ may not be formed by electron capture process. Now the question may arise whether electron loss or stripping of $^{12}C^{q-2}$ and $^{13}C^{q-2}$ on collision with ambient gas molecules in the second stage may also lead to the $^{12}C^{q-1}$ and $^{13}C^{q-1}$ beam. If it happens by this process one may see low energy peaks for every condition of the experiments but this is not the case.

The $^{12}C^{q+}$ and $^{13}C^{q+}$ peaks observed in the low energy side, not explained yet, can be produced by an electron detachment process. Negative molecules $^{13}CH^{-1}$ and $^{12}CH_2^{-1}$ may collide with the ambient gas molecules that produce the neutral molecules ^{13}CH and $^{12}CH_2$. Such molecules may reach to stripper with the previously gained momentum and strip their electron (s) to all possible charge states so that they can move along the second phase of the accelerating tube. It can easily be shown that rigidity of one unit lower charge state, i.e., $^{13}C^{(q-1)+}$ and $^{12}C^{(q-1)+}$ may match very well with the rigidity of $^{14}C^{q+}$. One can calculate the point of electron detachment taking place in meeting the magnetic rigidity condition for some typical values of TP and q in the following way:

$M14 \times E14/q^2 = R14 \quad M13 \times E13/(q-1)^2 = R14 \quad \text{and} \quad E13-[(q-1)\ TP + DP] = EDP$

Here M14 and M13 are mass of ^{14}C and ^{13}C, E14 and E13 are energy of ^{14}C and ^{13}C. R14 is the rigidity of ^{14}C, DP is the positive voltage applied to the ion source deck and EDP is the point far from ground where electron detachment would take place. Values of such parameters for a few typical TP and q are given in the Table I. If EDP found to be negative it is indicated that the case would be impossible.

Table 1. For a typical $^{14}C^{q}$ AMS experimental condition, the required beam energies for $^{12}C^{q-1}$ and $^{13}C^{q-1}$ are given. Point of electron detachment taking place is also shown as Eldet at d, d is the distance from the ground. If electron detachment has to occur before ground potential then it may be remarked that such beam is impossible. The abbreviation used here are DP for potential applied to the ion source deck, TP for the terminal potential of the tandem, Tot E for total energy, Mag. Rig. for magnetic rigidity, M the mass of ion, q for charge state, M' the mass of the spurious ion, q' for charge state of the spurious ion, E' the total energy of the spurious ion and EDP (MeV) for Electron detachment taking place at the energy (MeV). Few cases of ^{36}Cl measurements are also shown.

DP (MV)	TP (MV)	q	Tot E (MeV)	M	Mag. Reg.	q'	M'	E' (MeV)	EDP (MeV)	Remark
0.04	5.05	4	25.30	14	22.14	3	13	15.33	0.14	possible
0.04	5.05	3	20.25	14	31.50	2	13	9.69	-0.49	impossible
0.04	5.05	4	25.30	14	22.14	3	12	16.61	1.64	possible
0.04	5.05	3	20.25	14	31.50	2	12	10.50	0.41	impossible
0.04	5.05	5	30.36	14	17.00	4	13	20.92	0.72	possible
0.04	5.05	5	30.36	14	17.00	4	12	22.67	2.82	possible
0.04	5.05	6	35.41	14	13.77	5	13	26.48	1.27	possible
0.04	5.05	6	35.41	14	13.77	5	12	28.69	3.95	possible
0.04	1.00	2	3.04	14	10.64	1	13	0.82	-0.24	impossible
0.04	1.00	2	3.04	14	10.64	1	12	0.89	-0.18	impossible
0.04	0.50	2	1.54	14	5.39	1	13	0.41	-0.14	impossible
0.04	0.50	2	1.54	14	5.39	1	12	0.45	-0.11	impossible
0.259	11.14	6	78.24	14	30.43	5	12	63.39	8.67	possible
0.259	11.14	5	67.10	14	37.58	4	12	50.10	6.16	possible
0.259	11.14	4	55.96	14	48.96	3	12	36.72	3.55	possible
0.259	11.14	3	44.82	14	69.72	2	12	23.24	0.82	possible
0.26	11.14	2	33.68	14	117.88	1	12	9.82	-1.84	impossible
0.259	11.14	6	78.24	14	30.43	5	13	58.51	2.75	possible
0.259	11.14	5	67.10	14	37.58	4	13	46.25	1.54	possible
0.259	11.14	4	55.96	14	48.96	3	13	33.90	0.24	possible
0.259	11.14	3	44.82	14	69.72	2	13	21.45	-1.17	impossible
0.259	11.14	2	33.68	14	117.88	1	13	9.07	-2.51	impossible
0.259	12.81	11	153.98	36	45.81	11	37	149.80	8.41	possible
0.259	11.98	10	132.04	36	47.53	10	37	128.47	8.18	possible

From Table 1 one can see that not only the present work convincingly identified the backgrounds in the ^{14}C spectra as observed in laboratory [2,3] but it explains also when the spurious ions will be missing in the spectra. Further, electron detachment process might identify the backgrounds in any spectra. As for example, besides ^{36}S the ^{36}Cl spectra at Australian National University is having ^{37}Cl backgrounds but no ^{35}C [4]. Breakup reaction with ambient gas molecules in the drift space, $^{37}ClH^- = {}^{37}Cl^- + H$, can lead to $^{37}Cl^-$ passing the injector magnet and the hydride of $^{35}CH^-$ can pass the injector too. This means more $^{35}CH^-$ is injected than $^{37}Cl^-$ in the machine, however, ^{35}C is missing in the spectra. One can see in the Table

I that the electron detachment for the $^{37}Cl^{-}$ would take place at 8.41MeV so that 149.8 MeV $^{37}Cl^{+11}$ may show up in the 154 MeV $^{36}Cl^{+11}$ spectrum [5], whereas electron detachment for $^{35}Cl^{-1}$ has to occur at 2.53 MeV for $^{35}Cl^{+10}$. One can see that charge state fraction of $^{35}Cl^{+10}$ at 2.53 MeV is zero [6] and not observed in the spectrum. Similarly $^{37}Cl^{+10}$ ions come along with 132 MeV $^{36}Cl^{+10}$ but no $^{35}Cl^{+9}$.

In conclusion, we have shown for the first time that the electron detachment process occurring in the first stage of acceleration may produce many spurious ions which, in turn, are observed as spurious peaks in AMS spectrum. Besides electron detachment process, present work considers variation of electron capture cross sections and the charge state distribution of ions with its energy after the stripper material to explain the origin of various spurious peaks recorded using different accelerators.

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