Australian Accelerator Technical Forum 14th 16th September 2004

Abstracts

PRESENTATION TOPIC-MOTOR ALTERNATOR SET

Alan Cooper
Nuclear Physics Department,
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The Multisnics Ion Source, on level 5 of the 14 UD Tower, operates at a deck voltage of 120 KV. The systems and controls on the deck require 120 volts AC and that was provided by the Isolation Transformer on level 4 of the Tower. The Motor Alternator, developed here at Nuclear Physics, has replaced the Isolation Transformer. This has reduced the hum on the beam as well as the stored energy in the system that added energy to the occasional discharge propagated in the source acceleration tube.

The presentation will show various aspects of the development such as, mechanical, electrical and high voltage requirements and how these were addressed.

The Motor Alternator will be pointed out during the Nuclear Physics lab tour.

GRIDDED BUNCHER

Andy Rawlinson
Nuclear Physics Department,
ANU, Canberra ACT, 0200

A description will be given of an up-grade of the pre-Acceleration Gridded Buncher. The new installation will increase the beam capture rate of the buncher from approximately 25% to approximately 75%. The increase is to be achieved with the installation of additional electrodes and the use of 3 frequencies rather than the previous single frequency.

INTRODUCTION TO ANSTO'S DYNAMIC SIMS

Ian Kelly, Kathryn Prince
Australian Nuclear Science and Technology Organisation,
PMB1, MENAI, NSW 2234, Australia

The SIMS (Secondary Ion Mass Spectrometry) Facility located at ANSTO was established in 1992 for the purpose of micro-surface analysis using different analysis techniques. Use of this facility is available to ANSTO academic and industrial researchers. The CAMECA ims5f is a Magnetic Sector Dynamic SIMS equipped with dual sources, a Duoplasmatron (O_2^+, Ar^+ or O-) gas source and a Cesium (Cs^+) source. Sample chamber vacuum is generally maintained at 10^{-9} torr during analysis by means of rotary, ion, tubomolecular and cryogenic pumps. This presentation will discuss the technical overview of the system and the general maintenance schedule of the facility.

AUTOMATED LIQUID NITROGEN DISTRIBUTION SYSTEM AT THE ANU.

Alistair Muirhead
Nuclear Physics Department,
ANU, Canberra ACT, 0200

A twelve station, electronically controlled liquid nitrogen delivery system was designed and built at Nuclear Physics. This eliminated the need for manual filling the dewars attached to Compton suppressed high purity germanium detectors on the CAESAR experiment station at the ANU. These dewars vary in size and are filled daily, tri-daily or weekly. The liquid nitrogen is carried by an ANU fabricated vacuum insulated pipe from a 15000 litre low pressure storage tank some 25 meters away.

TARGET MAKING

Bob Turkentine
Nuclear Physics Department,
ANU, Canberra ACT, 0200

A description will be given of how devices such as the ring gun, saddle field ion source, electron gun and resistance heater are used in the production of targets. Techniques used to make carbon stripper foils and some of the more difficult targets like Tungsten and Rhenium will be discussed.

UPGRADE OF THE ANTARES COMPUTER CONTROL SYSTEM AND OUR EXPERIENCES OF EPICS

Damien Lynch
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

The Australian National Tandem for Applied Reserch (ANTARES) accelerator facility at ANSTO has recently upgraded its computer control system. The computer control system was implemented using the Experimental Physics and Industrial Control System (EPICS). This talk covers the hardware and software changes made during the upgrade and the our experience with EPICS.

SAFETY, QUALITY ASSURANCE AND LICENCING OF THE ANSTO ACCELERATORS

David Garton
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

Changes to Australian safety regulations imposed by state and federal laws and a philosophy to maintain competitiveness of accelerator based research and services has lead to dramatic change in the way the ANSTO accelerator facilities are managed. ANSTO has three accelerators all of which have attained operating licences through the Australian Radiation Protection and Nuclear Safety Agency, ARPANSA. The talk will discuss the mine field that was negotiated to reach the licenced status. It will also discuss the safety and quality culture that has arisen to meet ANSTO's strategic plan and changing global views on quality assurance.

SUBSTITUTING A POLYURETHANE CHARGING BELT FOR A KN 3000 RUBBER BELT AS A TEMPORARY REPLACEMENT

Greg Cooke
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

With the installation of the new HVEE Tandetron at ANSTO ("STAR") it was necessary to keep the 3MV going to maintain continuity of sampling and eventually to compare results between the two machines. The supply of rubber belts were no longer available and this had forced the machine to be used very sparingly with the imminent failure of a belt spelling the end to ANSTO's ASP sampling program until the STAR accelerator was commissioned.
Following on from work done by Dr Klaus Bahner from Denmark, the 3MV KN3000 single ended machine at ANSTO was used to try one of the recently considered Polyurethane conveyor belts as a substitute to the rubber charging belt. There was some success, some early failures, overheating and a change in operating strategy, however the 40 year old machine continues to achieve consistent results.

SF_6 GAS PLANT UPGRADE REDUCES BULK GAS TRANSFER TIME ON ANTARES

Steven Gatt
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

Recent upgrades and additions to ANTARES SF_6 gas handling plant resulted in transfer time being reduced by up to one third of the original time taken. Also, initial gas dew points achieved meant reduced shut down time for ANSTO. The talk will discuss these issues along with events that lead to the changes and an overview of the gas handling system.

Servicing challenges on a heavily used HVEE 846 Caesium sputter Ion Source

Peter Drewer
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

The 846 Caesium sputter ion source on the ANTARES accelerator at Lucas Heights is the main ion source *workhorse* and as such requires a high level of servicing. The ion source has undergone extensive development since it was purchased and some of the improvements are now seen in new versions of the source. This talk will discuss the challenges on the heavily used Caesium sputter Ion Source and some developments over the last twelve years.

TERMINAL PUMPING/ RECIRCULATION

Roland Szymanski. School of Physics
University of Melbourne.

Good vacuum is important to Ion beam transmission. To improve transmission and gain brightness from our RF ion source we have tried Terminal pumping/ recirculation with mixed results.

ANTARES VACUUM AND CRYO PUMPS REPAIRS

Kevin Thorpe
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

ANTARES predominantly uses cryogenic vacuum pumps to maintain a vacuum better than 5×10^{-5} Pa throughout the facility. Handling the vacuum system to ensure maximum effectiveness has become an issue in recent years after many new beamlines were installed. This talk will discuss the ANTARES accelerator beamline vacuum system including the components required to maintain the system at the required vacuum. It will include a brief description of Cryo pumps and how they pump as well as a procedure for repairing ASC & CTI cryo pump heads.

WATER COOLING OF THE ANSTO ACCELERATORS

Adam Sarbutt
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

Recent breakdown maintenance has occurred on a number of high voltage power supplies and valves on the cooling water reticulation system. Some of these faults are directly traceable to high conductivity in the cooling water systems. Cooling lines on the new accelerator at Lucas Heights has undergone extensive cleaning to remove metallic deposits that developed soon after installation. These problems and steps taken to identify and correct the problems will be discussed at the forum.

TROUBLES WITH HIGH VOLTAGE DURING COMMISSIONING OF ANSTO'S NEW 2MV TANDETRON ACCELERATOR.

David Button
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

The commissioning of the new 2MV Tandetron Accelerator at ANSTO by HVEE and ANSTO staff came up against troubles with the high voltage generator of the accelerator. This resulted at one period of time in a number of external, and internal sparks posing a safety hazard and disrupting operation of the machine. This discussion focuses on the steps taken by both HVEE and ANSTO in diagnosing and rectifying the problem.

IMPROVED ION SOURCE BRIGHTNESS

Roland Szymanski. School of Physics
University of Melbourne.

Ion source brightness is a important element to Nuclear Microprobe performance. We have been looking at a number of ways to improve the brightness of the 5U Pelletron RF ion source. This presentation will focus on the redesign of the Extractor Element as well as looking at the Ion source characteristics on the test bench.

SHORT HISTORY LESSON ON ELECTROSTATIC ACCELERATORS

Roland Szymanski. School of Physics
University of Melbourne.

Electrostatic Accelerators have had a long and distinguished career, This presentation will try to highlight the major developments over the last eighty years or so, and some of the people who contributed to their development.

ACCELERATORS AT ANSTO, LUCAS HEIGHTS

David Garton
ANSTO Environment
PMB 1, MENAI, NSW 2234, Australia

ANSTO has been operating accelerators for over 40 years and has recently acquired a new 2 MV Tandetron accelerator from HVEE with significant funding from Australian research Council (ARC). The new accelerator complements the exisiting 3MV Van de Graaff and the 10MV FN Tandem accelerators. The talk will give an overview of the three accelerators at Lucas heights and some recent uses and challenges.

Lab Reports

RADIOISOTOPE AND RADIOPHARMACEUTICAL PRODUCTION FOR POSITRON EMISSION TOMOGRAPHY, POST COMMISSIONING

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The Western Australian Radiopharmaceutical Production and Development (RAPID) facility began operations in August 2003 with an unshielded negative-ion medical cyclotron (18/9 MeV proton/deuteron beam energies), equipped for the production of ^{18}F, ^{13}N, ^{11}C and ^{15}O. In the ten months to June 2004, in excess of 2300 individual FDG doses were manufactured in accord with our mission to provide a comprehensive, cost-effective service for short-lived PET radiopharmaceuticals to all Western Australian customers. With a capacity to produce > 185GBq of ^{18}F on a single target, provision of ^{18}F-FDG to a local metropolitan customer has begun in addition to supply of an in-house camera at about 12 patients per day.

A comprehensive post-installation radiation survey confirms the constructed bunker exceeds the regulatory radiation design constraints. Monitoring of activation in cyclotron and bunker components at the time of the regular 3-monthly service has been initiated. Despite interventions by the manufacturer, significant improvements are required in reliability and efficiency of the FDG synthesis technology. The cyclotron was unavailable

for 9 days owing to scheduled maintenance performed by in-house staff, and a total of 35 (1.6%) patients were cancelled owing to unscheduled maintenance on 7 days.

The following major initiatives are now in place for the further development of this facility:

- Development of a solid targetry facility for the production of ^{123}I, ^{124}I, ^{64}Cu, and other isotopes.
- Two prototype external beam lines have been developed and trialed to facilitate solid targetry developments. Experiments designed to measure the beam profile at the end of the external beam line are underway.
- A synthesis module for the production of ^{18}FMISO and ^{18}FLT is being developed in-house in collaboration with the cyclotron manufacturer.
- A module for the synthesis of ^{18}F-Choline has been installed.

The Radiopharmaceutical Laboratory embodies Good Manufacturing Practice in its design and is currently negotiating with the TGA regarding the Draft PET radiopharmaceutical manufacturing standards.

Other reports

David Weisser
Roland Syzmanski
David Garton
Chris Purcell
Doug Arnott
Ian Kelly
Peter Caunt