SNEAP / ATF 2016 Abstracts

Progress report on the upgrades at ANU HIAF

Dr. Nikolai LOBANOV

Australian National University, Canberra, ACT

Abstract

This presentation will highlight recent upgrades and improvements on HIAF ANU comprising 15 MV 14UD electrostatic accelerator and 7 MV superconducting linac booster. A new techniques to diagnose issues with high-voltage components, low energy focus control and advanced linac tuning procedure, will be discussed.

The main results of commissioning the first stage of AMS fast switching system will also be presented.

From Obsolescence to Modernity – A journey from old technology to current technology

Mr. Tony MOWBRAY

Australian Nuclear Science and Technology Organisation, Sydney, Australia

Abstract

ANSTO's Tandetron Accelerator (STAR, 2MV) had an ageing High Voltage Generation facility, originally designed more than 30 years ago. Some issues with obsolete components, caused a search for a better way of using modern technology in providing currency of design.

Summary

ANSTO's Tandetron Accelerator (STAR, 2MV) had an ageing High Voltage Generation facility, originally designed more than 30 years ago. Some issues with obsolete components, caused a search for a better way of using modern technology in providing currency of design.

Preparation for the relocation of the 14UD control room

Mr. Dimitrios TSIFAKIS

Australian National University, Canberra, ACT

Abstract

The Australian National University has recently announced the funding of new buildings for the Research School of Physics and Engineering. The new buildings will replace existing ones and include the current, 40-year old, accelerator control room. As a result of this, preparations have begun to help with a smooth transition to the new control room. This talk will focus on describing the problems, the challenges and proposed solutions associated to this relocation.

3D Printing Developments and Our Experiences

Mr. Shane LONG

Australian Nuclear Science and Technology Organisation, Sydney, Australia

Abstract

A talk on developments that have taken place in 3D printing or additive manufacturing. This will also feature some of our experiences of using 3D printing at ANSTO and where we have used it.

Development of the Fast Fault Memory units at the Australian Synchrotron

Mr. Ross HOGAN[1], Mr. Joseph MICALLEF[2], Mr. Noel BASTEN[1], Dr. Simin CHEN[1],

Mr. Adam MICHALCZYK[1]

[1]Australian Synchrotron (ANSTO), Melbourne, Australia

[2]Arrayware Pty Ltd

Abstract

The design of a high speed data acquisition system implemented on a HTG-V6-PCIE Virtex-6 Xilinx FPGA platform will be presented in this poster. The Fast Fault Memory system will be constantly sampling, primarily, the interlock signals from the Low Level Radio Frequency System and logging the data into a circular buffer. The system will present high resolution post-mortem data to the control system via an Ethernet interface.

Fast Orbit Feedback Firmware Design at Australian Synchrotron

Dr. Simin CHEN[1], Mr. Ross HOGAN[1], Mr. Adam MICHALCZYK[1], Mr. Eugene TAN[1], Mr. Paul SAVAGE[2], Mr. Brett DICKSON[2]

[1]Australian Synchrotron (ANSTO), Melbourne, Australia

[2]Arrayware Pty Ltd

Abstract

A Fast Orbit Feedback (FOFB) firmware is development at Australian Synchrotron. The firmware receives grouping stream from a Libera BPM, extracts the beam position information, and computes the correction data for the fast response power supplies. The feedback control handler is built with MATLAB HDL coder from MATLAB code or Simulink blocks to achieve a better flexibility for accelerator scientists. In addition it has an gigabit Ethernet interface to the EPICS control system, with which the EPICS system is able to control the operation modes of the FOFB firmware, initialize the configuration memories, receive status reports of data integrity checks and read latched memory contents. The aim of the system is to damp the RMS transverse beam position motion to less than 10% of one sigma of the transverse beam size up to 120Hz.

The Accelerator Mass Spectrometry Systems at the Woods Hole Oceanographic Institution

Dr. Mark L. ROBERTS, Mr. Brett E. LONGWORTH, Mr. Joshua D. HLAVENKA, Mr. Joshua R. BURTON

Woods Hole Oceanographic Institution, Massachusetts, USA

Abstract

The National Ocean Sciences Accelerator Mass Spectrometry (NOSAMS) facility at the Woods Hole Oceanographic Institution operates two accelerator systems. Both systems are used exclusively for ¹⁴C AMS. The first system utilizes a 3 MV tandetron accelerator originally built by the US-AMS Corporation, with several recent upgrades. Most recently, this system was upgraded with a 134-sample gas-accepting, hybrid sputter Cs ion source (MC-SNICS) made by National Electrostatics Corporation (NEC). The other system is based on a 500 kV NEC Pelletron accelerator and incorporates both a 134-sample conventional graphite sputter source and a unique, gas-accepting, microwave ion source. Status and operational experiences with both accelerator systems will be presented.

ANU Radiocarbon Laboratory and the Single Stage Accelerator Mass Spectrometer, an update

Dr. Stewart FALLON, Dr. Rachel WOOD

Australian National University, Canberra, ACT

Abstract

In February 2007 a single stage AMS from the National Electrostatics Corp. (NEC) was installed at the Research School of Earth Sciences at the Australian National University. During this time the SSAMS has measured nearly 20,000 cathodes including standards and unknowns. Various changes to the instrument have occurred over that time, including more open extractor lens, re-alignment of the entire system and switching from Ar to He as the stripping gas. The largest effect on performance was the He stripping. This caused an increase in ion transmission from ~34% to nearly 48% without a negative effect to the background.

High Energy Stripper Disease in the 14UD

Mr. Thomas TUNNINGLEY, Dr. Nikolai LOBANOV, Mr. Alan COOPER

Australian National University, Canberra, ACT

Abstract

In late 2015, during a LINAC run, the 14UD was unable to hold its terminal voltage while a beam was being accelerated. Loading caused instabilities and a drop in the terminal voltage of about 2 MV. No issues were observed without a beam and, in fact, the 14UD had been conditioned to beyond 15 MV. The issue was narrowed down to unit 19 and the high energy stripper located in it. In February 2016 it was decided to undertake a tank opening to investigate the issue. This presentation will detail the findings, the solution, and future improvements to the high energy stripper.

Progress on the ANU 14UD Three-Frequency Buncher

Dr. Peter LINARDAKIS, Dr. Nikolai LOBANOV, Mr. Daniel TEMPRA

Australian National University, Canberra, ACT

Abstract

The Australian National University's Heavy Ion Accelerator Facility is continuing development of its low-energy, three-frequency bunching system. A direct-digital synthesis (DDS) based radiofrequency (RF) control system and three new RF amplifiers have been integrated into EPICS. Using the existing buncher electrode configuration, this system provides a minimum 50% increase in pulsed-beam intensity over a range of species from 12C to 64Ni and has contributed to the success of a number of major experiments. New prototype buncher electrode hardware is undergoing major design revisions to incorporate experience both from initial bench tests and actual experiments requiring pulsed beams.

David Weisser's Contribution to Accelerator Science and Technology

Dr. Nikolai LOBANOV

Australian National University, Canberra, ACT, Australia

Abstract

This talk will be dedicated to David Weisser's achievements in accelerators and experimental apparatus. David's approach, imagination and dedication played important part in placing HIAF at ANU among the world's best accelerator facilities.

EN-1 turning 60: still up and running

Mr. Louis GODBOUT, Mr. Réal GOSSELIN, Dr. Sjoerd ROORDA, Dr. François SCHIETTEKATTE

Universite de Montreal, Montreal, Canada

Abstract

The 6 MV EN-1 was the first prototype of a tandem accelerator, initially installed in 1957 at Chalk River, Ontario, Canada. In 1966, it was given to Université de Montréal where it served since for several generations of graduate students, supported by two generations technicians. Its original function was to support nuclear physics, but soon it was providing beams for materials science, notably by pioneering elastic recoil detection (ERD). Today it serves for materials modification, ion beam analysis, thin layer activation, and detector testing for particle and dark matter physics. In 2001, it went through a major upgrade during which the charging system was converted from a Van de Graaff to a NEC Pelletron, its injector was replace by the dual-source injector commonly found on HVEE Tandetrons, and the tubes and charge-exchange channel were also replaced by HVEE components. This upgrade improved the current by a factor of 10 and greatly improved the energy stability. The column structure and tank remain the original ones, as well as the analysing (90°) and switching magnets and their power supplies. The analysing magnet power supplies was replaced in 2005, together with the installation of an NMR probe, and the replacement of the other power supply is underway. This brings the challenge of having to support technologies spanning 60 years, from power supplies comprising lamp and relays to optical fiber controls operated by computers. In this presentation, we show some of these upgrades, including details about the conversion from Van de Graaff to Pelletron charging system.

Hollow on the Inside, Progress Towards Filament-less Duoplasmatron Ion Sources

Mr. David BUTTON[1], Dr. John FOSTER[2]

[1]Australian Nuclear Science and Technology Organisation, Sydney, Australia

[2]Australian National University, Canberra, ACT, Australia

Abstract

Interruption to accelerator experimental time due to ion source failure is the undesirable but somewhat tolerated nature of the work. ANSTO's 12 ion sources will be introduced, but will detail current progress in improving the reliability of our Duoplasmatrons. The standard General Ionex and NEC Duoplasmatron use a heated filament cathode to produce electrons for the production of plasma. These filaments are consumed during operation which can have a degrading or instant mode of failure. Based on the past experience by Dr John Foster of the SHRIMP team at ANU, we have taken our first steps in trialling a hollow nickel cold cathode to perform the role of the heated cathode. Though very preliminary these experiences will be discussed.

Completing the 8 Tesla Superconducting Solenoid

Mr. Stephen BATTISSON

Australian National University, Canberra, ACT, Australia

Abstract

The commissioning phase of the ANU 8 Tesla Solenoid project presented several challenges which had to be identified and overcome before the magnet would operate safely and reliably within the ANU iron yoke. I will outline the problems encountered and the resolutions which led to the first data being successfully taken in September 2016.

Criticality of Beam Temporal Stability for Quantitative Deadtime Correction on a Nuclear Microprobe

Dr. Jamie LAIRD[1], Mr. Stephen GREGORY[1], Dr. Chris RYAN[2], Mr. Roland SZYMANSKI[1]

[1]University of Melbourne, Melbourne, Australia

[2]CSIRO, Australia

Abstract

Deadtime correction algorithms used to quantify absolute quantities in u-Particle Induced X-ray Emission (PIXE) as well as other Ion Beam Analysis (IBA) methods rely heavily on simplistic assumptions regarding an appropriate dead-time model which combines non-paralyzing and sometimes paralyzing components. However, issues surrounding beam bunching and beam current stabilization on the scale of a pixel dwell time lead to a significant breakdown and indeed intractable solutions to dead-time correction. In this poster we discuss these issues and point to possible modes of operation where quantification can be restored. We illustrate both modes of operation illustrating problems that can arise for the non-wary beam-line scientist.

Superior Control Room Alarm Management

Mr. Joel TREWHELLA, Mr. Cameron RODDA, Mr. Andrew STARRITT

Australian Synchrotron, Melbourne, Australia

Abstract

One of the most important tools in the Australian Synchrotron control room is an active and responsive alarm management system. After years of utilising the Experimental Physics and Industrial Control System (EPICS) alarm handler (ALH), we required a more modern, integrated, modular and flexible system. Thus, the Superior Control Room Alarm Management (SCRAM) system was conceptualised. Design principles aim to increase integration into our existing electronic logs/reports, work order systems, announcements and SMS services. System architecture will be based on a client/server model. The back-end will consist of a Python alarm server and MySQL relational database. This will enable more dynamic front-end web and Qt client interfaces (GUI). Increasing the capabilities and integration of the alarm management system will increase the efficiency of the control room responses in handling alarm events. It will also allow improvements of our current “alarm philosophy” on how to provide useful alarms.

Status and Recent Upgrades of the Tandem Accelerator Facility at RBI Zagreb

Mr. Damir ŠPANJA, Mr. Skukan NATKO

Institut Ruđer Bošković, Croatia

Abstract

The presentation will focus on the status of the Rudjer Boskovic Tandem Accelerator facility and its upgrades performed during the last decade. The facility consists of 6 MV EN Tandem and 1 MV Tandetron accelerators with a number of beam lines dedicated for ion beam analysis applications, material modification studies and nuclear physics experiments. One of the most important upgrades is the conversion of the accelerator controls from analog to digital home made based system. Sputtering ion sources have been installed at both accelerators, enabling acceleration of wide range of negative ion species. EN Tandem has been upgraded by introduction of the turbomolecular pumping system at the terminal, which significantly improved transmission of heavy ions through the system. Several new beam lines have been installed, including dual beam line that can deliver simultaneously ion beams from both accelerators to the same spot on a target. The ion microbeam end station has been upgraded from dublet to quintuplet configuration. First home made prototype of magnetic quadrupole triplet for ion microbeam applications has been designed, constructed and tested.

Caesium the Necessary Evil

Mr. Brent GRAHAM, Mr. Ben TRANTER

Australian National University, Canberra, ACT, Australia

Abstract

Heavy Ion Accelerator Facility, Australian National University, Canberra ACT Australia The Australian National University's Department of Nuclear Physics uses two different types of sputter types for negative Ion particles, one is a Multi- Cathode SNICS and the other is SNICS source. Both use caesium sputtering systems which produce negative ions. The beam is injected into the pelletron 14UD accelerator.

Both types of Ion sources are a NEC product, which has been modified over the years to suit our changing needs. Our operators experience confirms that SNICS source has better reliability and lifetime on its insulating components than the MCSNICS source.

Summary

This presentation will highlight why there is Caesium build up in the MSNICS in contrast to the SNICS source, diminishing performance and sparking in the pre-acceleration tubes in the MSNICS and we will discuss unrestricted caesium shielding which is the more restricted method in the SNICS source.

Our presentation will discuss the possible ways to reduce or improve future shielding and improve life time of the insulators in the Source.

Automated Radiosynthesis of PET-Optical Imaging Probes using Microfluidics and Cyclotron Generated [18F] Fluorine

Mr. Mitchell KLENNER[1&2], Dr. Giancarlo PASCALI[1], Dr. Benjamin FRASER[1], Dr. Max MASSI[2],

Mr. Bo ZHANG[1], Ms. Tiffany SIA[1&3]

[1]Australian Nuclear Science and Technology Organisation, Sydney, Australia

[2]Curtin University

[3]ANSTO/BMI (University of Sydney)

Abstract

The contents of this presentation demonstrate the applicable outcomes of using a cyclotron particle accelerator to generate radioisotopes used in the development of new nuclear medicines, such as Positron Emission Tomography (PET) agents. An automated set-up was constructed using microfluidic technologies to perform multiple radiosyntheses of a novel PET-optical probe. Ligands were synthesised and [^{18}F]radiofluorination performed on both the rhenium(I) complexed and uncomplexed reagents using this automated set-up. It was found that rhenium(I) complexation of the ligands remarkably improved radiofluorination not only in high yields, though also under hydrous and low temperature conditions; ideal for the formation of PET imaging agents. Further work is under investigation to bioconjugate the PET-Optical probe, and to apply this radiofluorination strategy towards the improved development of existing PET probes.

Summary

The radiosynthesis of a novel [^{18}F]fluorine labelled rhenium(I) PET-Optical complex was achieved using microfluidic technologies and cyclotron produced [^{18}F]fluorine radioisotope. Automation of the process not only allowed for rapid method development to improve radiochemical yields, though also revealed an unexpected mechanistic insight toward a novel means of radiofluorination.

An overview of the Centre for Accelerator Science Accelerators

Mr. David GARTON

Australian Nuclear Science and Technology Organisation, Sydney, Australia

Abstract

ANSTO has undergone several key changes in recent years to streamline and improve the efficiency and availability of the research infrastructure at ANSTO. The Centre for Accelerator Science (CAS) is one such area. The infrastructure for CAS comprises 4 accelerator facilities that provide accelerator based research tools for science and industry. This talk will provide an overview of the accelerator facilities and some of the challenges to integrate two new Pelletron machines with the existing facilities under one CAS umbrella.

Swagelok Innovation

Mr. Michael WHAWELL

Swagelok, NSW, Australia

Abstract

We will take you on a journey of discovery, where a small tube fitting manufacturer became a global strategic partner across many industries. We will see first-hand innovations, directly developed for our research and nuclear industries and pose a question to you all. How can Swagelok support you to achieve your goals?

Accelerator Control Systems, Utilising Industrial Automation Platforms

Mr. Shaun KOZANIC

Australian Nuclear Science and Technology Organisation, Sydney, Australia

Abstract

This talk will cover the current state of ANTARES control system, upgrading of ANTARES control system, EtherCAT technologies, TwinCAT 3 automation environment, and provide discussion into key considerations when applying this new of technology to such a control system.