



Contribution ID: 32

Type: **Invited Lecture**

## **INVITED LECTURE - Cyclotron production of radionuclides with medium-energy proton beams and high-power targetry**

*Wednesday, 19 September 2012 11:20 (20 minutes)*

At iThemba LABS, proton beams of 66 MeV are used for the routine production of radionuclides and for neutron therapy. Between treatment irradiations, the beam is switched to the radionuclide production vaults and vice versa. Dedicated beam time for radionuclide production is also scheduled at night.

In recent years, several facility upgrades and new additions had been geared towards increasing the radionuclide production capacity by increasing the beam intensity. The development of suitable targetry to exploit the higher beam intensities were pursued in parallel. In addition, a beam splitter was developed and put into routine operation, which makes it possible to bombard two radionuclide production targets simultaneously. These developments, together with the addition of a new vertical beam target station (VBTS) led to a three-fold increase in production capability.

The main accelerator developments to achieve higher beam intensities were the addition of flat-topping resonators to one of the solid-pole injector cyclotrons (SPC1) and the separated sector cyclotron (SSC) as well as an additional RF buncher in the transfer beam line between them. This also required improved beam diagnostics, including non-destructive beam position monitors for continuous display of the beam position as well as stray-beam monitors installed at regular intervals along all the high-energy beam lines leading to the radionuclide production vaults. Extraction of 66 MeV proton beams with intensities up to 300 micro-ampere is now routinely possible, which can be accommodated on certain targets if rapid beam sweeping is employed.

The evolution of the radionuclide production programme at iThemba LABS with emphasis on the developments over the last circa 5 years will be presented. This will include an account of our experiences with high-power targets, in particular the VBTS tandem targets for the production of Na-22, Ge-68 and Sr-82.

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**Session Classification:** Session 8 - Nuclear Chemistry, Radionuclide Production, High-Power Targetry

**Track Classification:** Nuclear Chemistry, Radionuclide Production, High-Power Targetry