

## DEVELOPMENT ACTIVITIES IN THE ACCELERATOR OPERATIONS GROUP DEVELOPMENT TASK

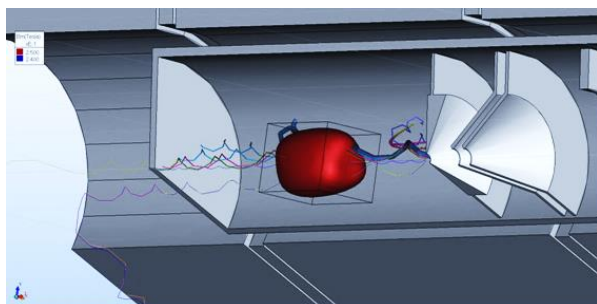
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The Operations Group Development team within the ANSTO Accelerator facilities are currently pursuing a number of activities to further develop our equipment and technical capabilities.

These include broadly;

- Electron Cyclotron Resonance Ion Sources (ECRIS)
- Virtual Instrumentation
- Beam Profile Monitor Enhancements
- Vacuum System Operation Methods
- Current Digitisers/Integrators



### Electron Cyclotron Resonance Ion Sources (ECRIS)

ANSTO's initial involvement with ECRIS's was for the novel measurement technique of stable isotopic ratios of multiple charged state ions. From this beginning we hope to investigate the COMIC style micro ECRIS for helium ion production as an alternative to Duoplasmatron and Alphatross ion sources, and potential terminal installable ion source to use the tandem in single ended mode. This forgoes the need to charge exchange either hydrogen or helium.

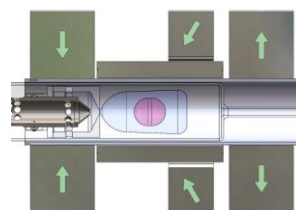
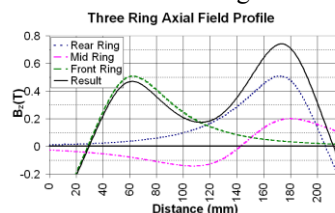
Unique in our ECRIS design, we are able to rotate the hexapole to steer the electron loss streams to bombard normally inert areas of the plasma chamber to stimulate the release of deposited material. This source is used for our isotopic ratio mass spectrometer, and additionally has been designed with a slanted ring field to improve the confinement at the rear of the source, and reduce the  $B_{min}$  of the magnetic structure to allow a more compact design.

Currently we are also involved in the development of a high current 2.45GHz ECRIS for operation of a Neutron source at the Institute for Plasma Research in Gujarat-India as part of the ITER project.

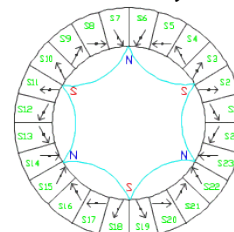


*Recently constructed Isotopic Ratio Mass Spectrometer (IRMS++) instrument, based on the removal of molecular interferences due to their destruction at high charge states which are produced in a 7GHz ECRIS.*

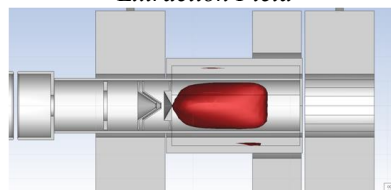
#### IRMS++ Permanent Magnetic Design



#### Offset Halbach Array Hexapole

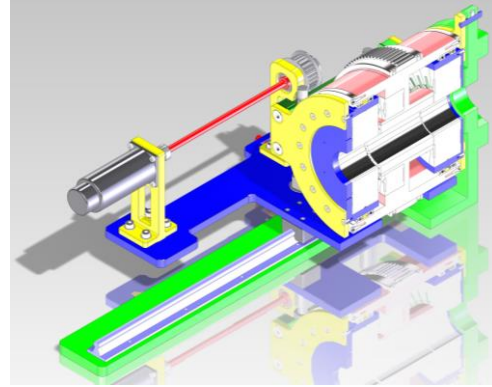


#### Extraction Field

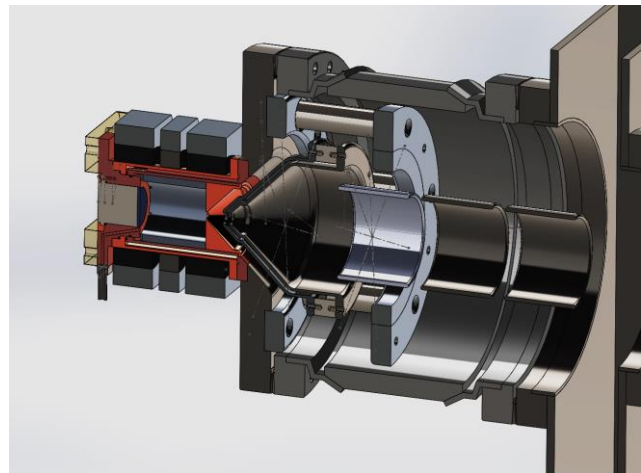
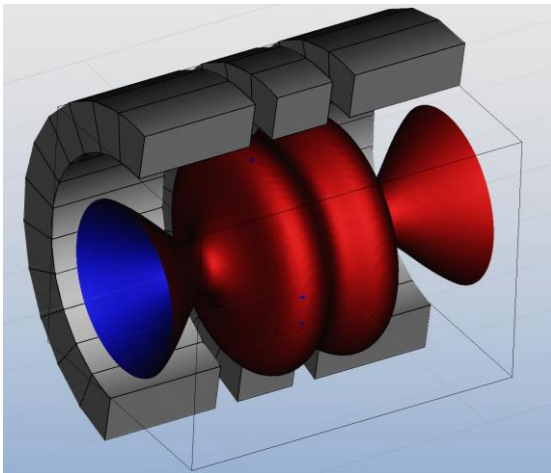




New 7GHz ECRIS first plasma



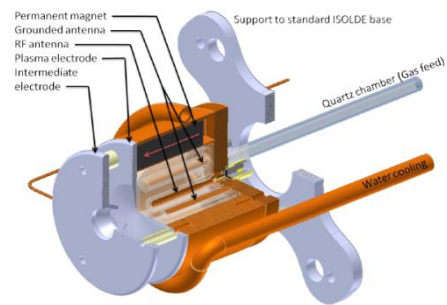
Rotating Hexapole Design



Initial designs produced for the 2.45GHz India Institute for Plasma Research ECRIS. Note that this design builds of the PKU, and CEA Saclay developments with the plasma chamber diameter less than the cut off frequency for the 2.45GHz microwave propagation. The image to the left shows the 075T ECR zone of the source.

## Micro ECRIS

The figure shown to the right features a COMIC, micro ECRIS. These sources are a relatively low cost to produce, and require very little maintenance due to the lack of any filament, and the cavity being metallic and conductive. This reduces the effect of drop in performance that that capacitive and inductive coupled source experience as metallic contaminates disrupt the RF coupling. Currently we have made purchase of the RF amplifier and signal generator, but are waiting on resourcing opportunity to construct the actual source, and hope to report further on this in future.



The above is taken from P. Suominen poster and paper presentation from the 18th International ECRIS Workshop. This feature a low cost COMIC micro ECRIS.