university of groningen / kvi - center for advanced radiation technology

#445

Commissioning of the in-air Heavy Ion irradiation facility with 30 MeV/amu Xe Beam

M.A. Hofstee, M-J. van Goethem, R. Ostendorf, H. Kiewiet, J. de Jong, S. Brandenburg,
KVI-Center for Advanced Radiation Technology, University of Groningen,
Zernikelaan 25, 9747 AA Groningen, The Netherlands

Abstract We have expanded our **in-air irradiation** facility used for radiation effect and radiobiology experiments with a modified setup to be able to irradiate samples with **heavy ion beams** up to **30 MeV/amu Xenon**. The XY-translation stage has been enhanced with z-translation and theta rotation capabilities. The beam diagnostics have been adjusted and the degrader system modified to work with heavy ion beams. A new cocktail of 30 MeV/A beams ranging from molecular deuterium to Xenon has been developed for use with this facility. Further developments, such as improving the real-time diagnostics and increasing the beam energy, are anticipated

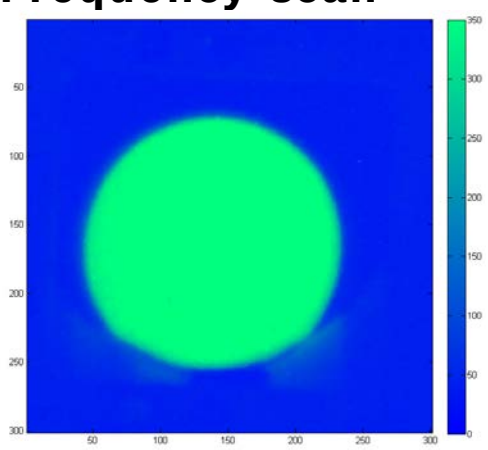
30 MeV/A cocktail on Silicon

Ion	Range [μm]	LET @ E_{beam} [MeV/(mg/cm^2)]	Max LET [MeV/(mg/cm^2)]	E_{beam} at Max LET
^{12}C *	1670	0.524	5.13	3.0
^{16}O *	1230	0.949	7.17	4.5
^{20}Ne	1020	1.467	8.95	15
^{40}Ar	676	4.766	18.7	45
^{84}Kr	436	16.79	40.9	180
^{124}Xe	324	36.83	**69.3**	500

*Not used in the commissioning experiment

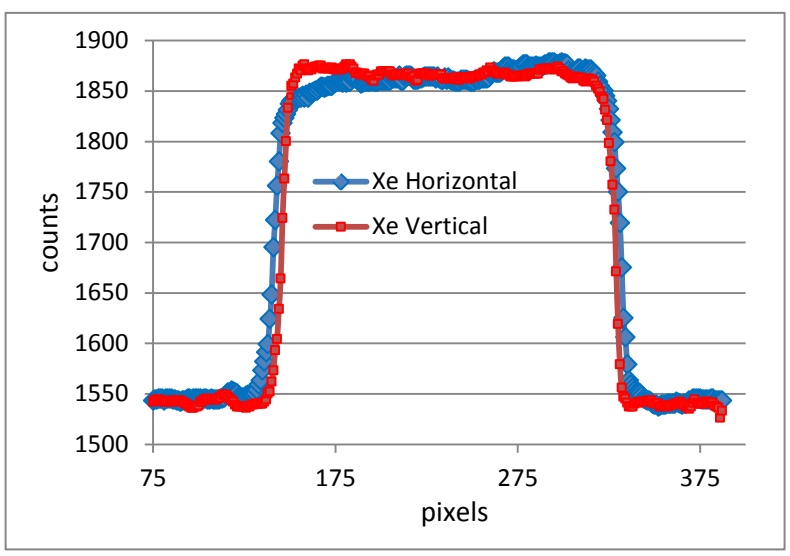
Commissioning

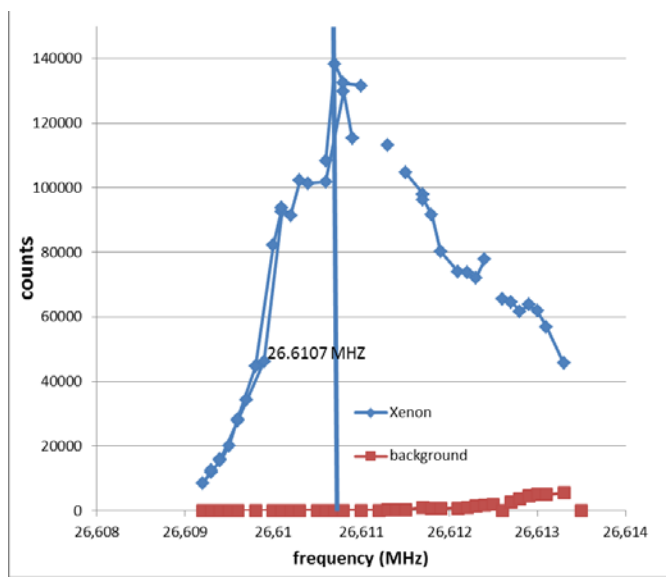
Xenon Field-shape and Frequency-scan



Lanex Image

Cross-sections of the Lanex Image



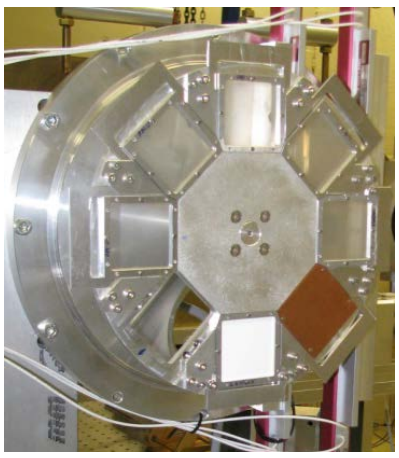


Frequency-scan

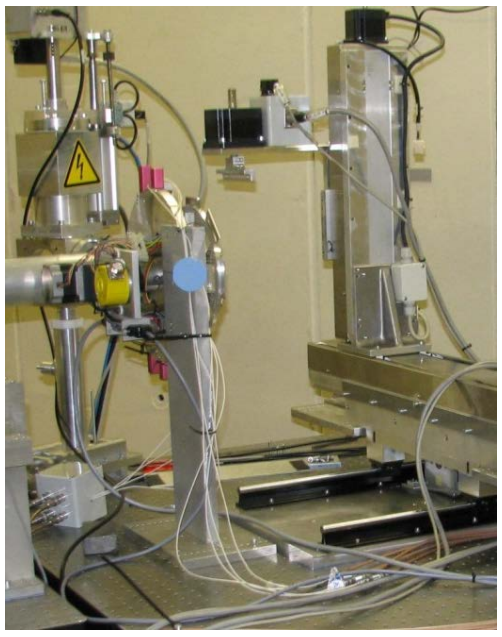
Lanex Image for Measurement of field
- Field Size up to Ø 3.5 cm
- Homogeneity better than 15 %
- Collimator for field definition

Thin-window NE213 detector at DUT position.
- Resolution $(\Delta Q/A) / (Q/A) \approx 10^{-4}$
- Beam purity > 10^3:1
- Flux 20 - 10^5 particles/cm^{2}s

SETUP



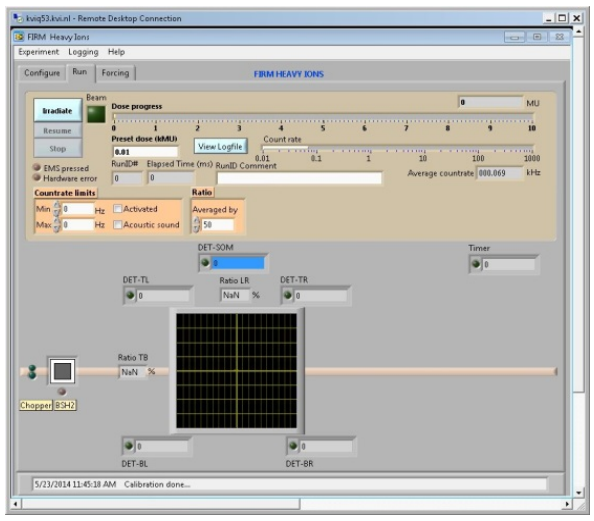
Degrader wheel
- 8 slots
- Easily exchanged



XYZ-translation stage
- rotatable mount for DUT
- laser positioning system

Degrader mount
- Four peripheral detectors
  - monitor flux
- collimator (not visible)
  - 2.5 x 2.5 cm^2 used

User interface
- Field Alignment
- Flux
- Positioning



More information at http://www.agorfirm.nl/