11TH NEUTRON AND ION DOSIMETRY SYMPOSIUM

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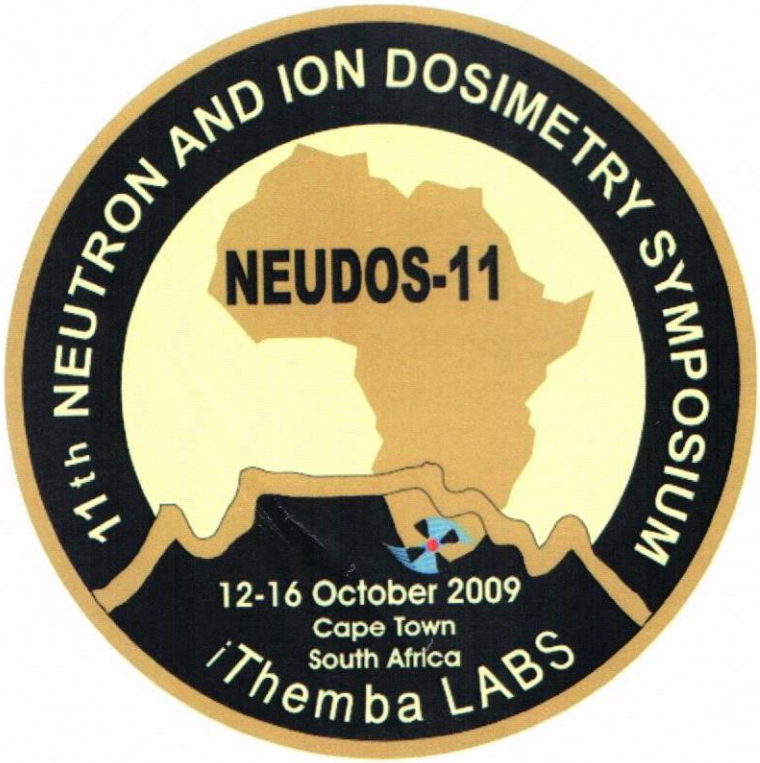

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DOSIMETRY AND SPECTROMETRY AT ACCELERATOR BASED NEUTRON SOURCE FOR BORON NEUTRON CAPTURE THERAPY

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An innovative accelerator-based neutron source for boron neutron capture therapy [1] has started operation at the Budker Institute of Nuclear Physics, Novosibirsk [2]. This facility is based on a compact vacuum insulation tandem accelerator designed to produce proton current up to 10 mA. Epithermal neutrons are proposed to be generated by 1,915 MeV protons bombarding a lithium target using $^{7}Li(p,n)^{7}Be$ threshold reaction.

NaI and BGO gamma-spectrometers are used to measure gamma radiation. As each neutron yielded in reaction $^{7}Li(p,n)^{7}Be$ is accompanied by the occurrence of ^{7}Be radioactive nuclei, the total yield of neutrons is determined by measuring the 477 keV γ-quanta from beryllium decay. For the primary analysis of the generated neutrons spectrum we used bubble detectors BDT and BD100R (Bubble Technology Industries, Canada). ^{127}I natural isotope has some resonances of neutron capture with energies from 20 eV to 1 keV with cross-sections about tens of barn. As the epithermal neutrons are of interest for neutron capture therapy the use of NaI as activation detector seems to be the ideal case. In this work the results of the first experiments on generating neutrons are presented and discussed.

Time-of-flight technique is proposed for neutron spectra measurement. For a short interval of time the energy of proton increases from 1.865 MeV (lower than the threshold of the $^{7}Li(p,n)^{7}Be$ reaction that is 1.882 MeV) up to 1.915 MeV. The energy increase is performed by supplying the square pulse of 50 kV for 200 ns on neutron-generating target that is isolated from facility body. During this 200 ns the generation of neutrons is performed. The registration of neutrons is made with neutron detector Saint-Gobain, consisting of cerium activated lithium silicate glass scintillator GS20. This detector prolongs the region of effective neutron registration up to 500 keV. The neutron spectrum is detected according to time of delay in its registration.

The report reveals the mentioned methodology in details and declares immediate task and plans.

References

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MEASUREMENT AND CALCULATION OF COSMIC RADIATION EXPOSURE DURING A POLE-TO-POLE FLIGHT SEQUENCE

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During November 2008, TAG Aviation (UK) flew a Global Express business jet (manufactured by Bombardier Aerospace) from the North Pole to the South Pole at an average speed of 444 knots, 21 knots faster than the 31 year old record set by a Pan Am Boeing 474SP, despite requiring five stopovers for refuelling. The average cruising altitude for this flight was over 42,000 ft, peaking at just over 46,000 ft. In-flight dosimetry was carried out using a Hawk tissue equivalent proportional counter (TEPC, manufactured by Far West Technology Inc, California), calibrated at the CERN High Energy Reference Field (CERF) two months previously. Also included were two EPDN2 electronic personal dosimeters (manufactured by Thermo Scientific), which had also been tested at the CERF facility.

The total exposure for the entire flight (including flying to and from Farnborough Airport, UK) was measured to be 276 microsieverts (H*(10)), with an uncertainty of approximately 10% arising from uncertainties in the CERF irradiation field. Flight