INVESTIGATION OF CHANGES IN BACKGROUND RADIATION DUE TO TECHNOSPHERE OBJECTS

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The gamma-background of the urban atmosphere is formed to a greater extent by the radiation of radionuclides contained in the soil, building materials, and the atmosphere. The influence of various objects of the Technosphere has practically not been studied by anyone. It is not known which objects will increase the total urban gamma background, and which ones will decrease. The foregoing determined the main goal of this work - the study of the influence of Technosphere objects on the gamma background radiation of the urban environment. The study was carried out in the city of Tomsk, Russia. Background radiation was studied using highly sensitive intelligent gamma detectors BDKG-03. It was determined that, within a radius of 1m from certain Technosphere objects the absorbed dose was 1.5 to 4.4 higher than the UNSCEAR recommended safe limit. The highest recorded dose for a person standing 50cm away from the technosphere objects was 204 nGy/h which is 2.4 times higher than the recommended safe limit. The range of absorbed dose was 84 nGy/h to 374 nGy/h. The highest calculated range of AEDE was 0.17 to 0.57 mSv/yr and ELCR was 0.59 10^{-3} to 2.01 10^{-3}.

MCNP SIMULATIONS OF DETECTOR RESPONSE FOR DIFFERENT NEUTRON ENERGIES OF THE DETECTOR: A HIGHLY SENSITIVE SILVER-ACTIVATION DETECTOR

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In this work, a simulations using Monte-Carlo code MCNP is used to simulate the fast neutron detector indicated in the paper [1] and also different materials and designs to get the most efficient design of detecting and registering signals due to fast neutrons interaction within the active materials (silver an others) and the plastic scintillator (here is NE-110). This detector consists of 31 silver foils (101.6 x 203.2 x 0.245 mm) sandwiched between 32 plates of NE-110 plastic scintillator, each 102.0 x 204.0 x 3.2 mm.

In the MCNP simulations, the following parameters were used in the input file: 1. The Neutron flux produced by 2 μA deuteron ions (13.6 MeV) collided with beryllium target (compressed powder 3-mm thick 11-cm in diameter) equal to (2.93 x 10^{11} n/s). 2. The detector-cell «cell of collected energy and charge resulted from neutron interactions with detector materials » in the input file chosen to be filled with Air. 3. The plastic scintillator used in simulations is the Anthracene $C_{14}H_{10}$ (density = 1.28 g. cm^{-3} at 25 ^oC).

The results of the detector response (64 sheets of silver + scintillator) as a function of neutron energies for two cases: 1. For 10 cm paraffin moderator in front of the source and 5 cm for paraffin moderator on the sides of the detector, 2. For 15 cm paraffin moderator in front of the source and 5 cm for paraffin moderator on the sides of the detector.

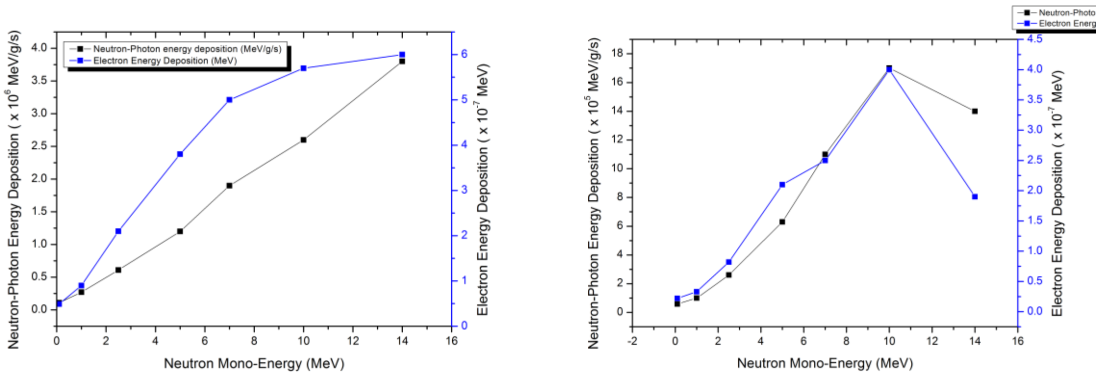

Fig.1. the detector response for 10 cm paraffin moderator in front of the source (left) and for 15 cm paraffin moderator in front of the source (right).

REFERENCES

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THE PROBABILITY OF COMPLICATIONS OF ORGANS AT RISK (OAR) OF THE HEAD-AND-NECK WITH SIMULTANEOUS INTEGRATED BOOST AND SEQUENTIAL INTENSITY-MODULATED RADIOTHERAPY TECHNIQUES

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Head and neck cancer belong to the most prevalent cancers, and are the sixth leading cause of cancer worldwide. Radiotherapy is an important treatment modality in head and neck cancer. In recent years new radiotherapy techniques have been developed. The IMRT technique is characterized by a highly conformal dose distribution to targets, whereas a constraint dose to organs at risk (OARs) [1]. Sequential boost (SEQ) intensity-modulated radiation therapy regimens for HNC are composed of elective irradiation followed by a series of reduced boost fields aiming at the different overall doses needed for tumor control or OARs tolerance. Simultaneous integrated boost (SIB) technique gained popularity as it improved planning efficiency and escalated the dose per fraction delivered to the gross target volume (GTV) to potentially enhance tumor control [2]. SIB-IMRT is a safe and effective treatment for HNC, whereas it offers the following advantages: shortening of the treatment time and increased biologically equivalent dose (BED) to the tumor with dose per fraction slightly >2 Gy [3].

***Aim**:* The purpose of this work was to Compare prescription dose coverage of planning target volume (PTV) and complication of organs at risk (OAR) based on dose volume histogram (DVH) from sequential (SEQ) and simultaneous integrated boost (SIB) plans delivered with volumetric modulated arc therapy (VMAT) for patients with squamous cell cancer of the head and neck (HNSCC).

***Patients and methods**:* SEQ and SIB plans using VMAT for 10 HNSCC patients were generated and analyzed for differences in dose distribution, coverage to the planning target volumes (PTV) 70–50 and sparing of organs at risk (OAR). Also, biological effective doses were calculated for PTV70-50, brain stem and spinal cord.