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PAPER TITLE APPLICATION OF PROMPT GAMMA-RAY SPECTROMETRY FOR REGISTRATION, SPECTROMETRY AND DOSIMETRY OF NEUTRONS IN NCT INVESTIGATION

G.I. Borisov, A.M. Demidov

AUTHOR(S) NAME(S)

SUBMITTING AUTHOR

LAST NAME Borissov FIRST NAME Georgui TITLE Ph.D

AFFILIATION "Russian research center Kurchatov Institute" TEL (+7-095) 943-76-77

STREET Birzova 43, 136 FAX (+7-095) 943-76-86

CODE 123060 CITY Moscow COUNTRY Russia

PRESENTING AUTHOR (IF DIFFERENT)

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ABSTRACT (See instructions overleaf)

IR-8 reactor of the Russian Research Center (RRC) Kurchatov Institute was used for neutron capture therapy (NCT) investigations with experimental animals. Besides that, new methods and devices for operative neutron fluxes control, on line prompt γ -ray neutron dosimetry for operative control NCT and tailoring neutron beam for NCT were worked out. The following major methodic results are obtained:

1. Methods and devices for neutron beam control.

The devices are suggested for operative control of neutron fluxes, their spectral and dose characteristics with the energy range from 10 neV to 10 MeV, in which spectrometry of prompt γ - rays produced in the interaction of neutrons with the multilayered targets, is used.

2. Method on line neutron dosimetry.

Also a method for in situ neutron dosimetry on line by means of prompt γ -ray spectrometry is offered. This method is based on the determination of nuclear reactions quantity in the irradiated objects by the registered intensity of γ -rays. The energy of each reaction product, absorbed in the object is computed with the help of nuclear and atomic data tables.

3. Thermal and epithermal neutron beam tailoring method.

The hydrogenous scatterer of small thickness is suggested for tailoring of intensive therapeutic neutron beams with small contribution of fast neutrons (1%) and γ -rays. The scatterer is disposed in tangential experimental channel of reactor. Decreasing of fast neutron contribution and consequently fast neutrons KERMA reducing of the neutron beam are achieved due to peculiar energy dependence of neutron scattering cross section on hydrogen nuclei.