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# Design of Miniature Neutron Source Reactor with LEU Core

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MNSR with HEU core is mainly used for the neutron activation analysis (NAA), some short-live isotopes production and as training and teaching tool. In order to enlarge the usage of MNSR, such as, medical treatment, physics experiment, prompt gamma neutron activation analysis (PGNAA) and neutron radiography, the neutron beams on the horizontal direction are designed on the both sides of the reactor core.
Improved MNSR with thermal power 30kW is an undermoderated reactor of pool-tank type, UO2 with enrichment of 13.0% as fuel, light water as coolant and moderator, and metal beryllium as reflector.
In the previous paper, the design of the thermal neutron beam was introduced. This paper will introduce the design of the epithermal neutron beam on MNSR.

MCNP code is employed to perform the calculations of the frame design of the epithermal neutron beam, which is mainly composed of neutron moderation layer, thermal neutron absorption layer, gamma ray shielding layer, neutron collimator parts. The moderator materials used probably for the design of the epithermal neutron beam, such as, water, graphite, aluminum, Al2O3, Fluental and other material, are selected according to neutron absorption cross section and scattering cross section of the different nuclides, Fluental with thickness of 50cm is selected as the final moderator material according to the calculating values of the epithermal neutron flux density, gamma and fast neutron contamination at the exit of the epithermal neutron beam for the different moderator materials.

Fig.1 [see attached file] shows the diagram of the final design of the epithermal neutron beam, the final calculating parameters at the exit of the epithermal neutron beam are listed in table 1, the results show that the parameters can meet the requirement for Boron Neutron Capture therapy (BNCT)

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