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Three tier blistering tolerant neutron target for iBNCT by using 80kW proton linac.

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An accelerator-based BNCT (Boron Neutron Capture Therapy) facility is being constructed at the Ibaraki Neutron Medical Research Center, Japan. It consists of a proton linac of 80kW beam power with 8 MeV energy and 10mA average current, a beryllium target, and a moderator system to provide an epi-thermal neutron flux enough for patient treatment. The technology choices for this present system were driven by the need to site the facility in a hospital and where low residual activity is essential. The maximum neutron energy produced from an 8 MeV-proton is 6 MeV, which is below the threshold energy of the main nuclear reactions which produce radioactive products. The down side of this technology choice is that it produces a high density heat load on the target so that cooling and hydrogen aniti-blistering amelioration prevent sever challenges requiring successful R&D progress. The precise in-situ observation using polarized long distance microscopy with proton beam irradiation presents the performance of hydrogen storage alloys. Diffusion bonding method of Be, hydrogen storage alloy, Cu is also developed. The nucleate boiling method is applied. This solid neutron target is manufacturing and will be installed in this summer shutdown period.
The latest design of the target and moderator system shows that a flux of 4×10^9 epi-thermal neutrons / cm2 / sec can be obtained. This is much higher than the flux from the existing nuclear reactor based BNCT facility at JAEA (JRR-4).

Summary

An accelerator-based BNCT (Boron Neutron Capture Therapy) facility is being constructed at the Ibaraki Neutron Medical Research Center, Japan. It consists of 4.5MW/m^2 heat density, a three tier blistering tolerant Be neutron target with nucleated boiling region water cooling. This target is manufacturing and will be installed in this summer shutdown period.

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