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→ New Challenges

Progamme & Abstracts

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Accelerator Neutron Sources and Physics (AC)

reaches 25 kW heat lithium, but the effective heat removal helps keep it in the solid state thus retaining the radioactive isotope within the lithium layer and preventing its spread with vapor over the entire facility. It is proposed that the target should be removed after its activity becomes prohibitively high or its life runs out, and put into a protective subsurface container for holding and temporary storage. Such a procedure seems optimal because the 53-days-long half-life of beryllium-7 is long enough to allow target removal operations near the source to be accomplished and short enough to allow the natural deactivation of the target.

Results and discussion: The maximum activity of targets in the container was determined. Gamma transport simulations by the Monte Carlo method were done with the code PRIZMA to determine the optimal size of the container which must ensure radiation safety for personnel. Their results were used to develop and adjust the detailed design of the container. Later the container was constructed and put into operation.

Thus, with the constructed container for activated target holding and storage, it becomes possible to implement sustained neutron generation on the facility designed for systematic research in boron-neutron-capture therapy.

AC - 5
New technical solution for use the time-of-flight technique to measure neutron spectra

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Introduction: An innovative accelerator-based neutron source for boron neutron capture therapy has started operation at the Budker Institute of Nuclear Physics, Novosibirsk. 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.

Results and discussion: New technical decision is proposed for use the time-of-flight technique to measure neutron spectra. 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 these 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 enhances the region of effective neutron registration up to 500 keV. The neutron spectrum is detected according to time of delay in its registration. The high voltage modulator for time-of-flight technique has been created. It consists of: the high-voltage pulse commutator on the base of industrial thyratron with hollow cathode TPI-1 10 kA/50 kV, unit for creation of heater voltage, triggering unit and double pulse forming line. The result of measuring the high-voltage pulse of the modulator on matched load of pulse forming line R = 150 Ohm at test frequency 50 Hz is shown that this pulse possesses practically rectangular shape with duration 200 ns at the leading and falling edges durations 18 ns and 25 ns respectively. The amplitude of the pulse in this testing experiment was 40 kV.

So, the time-of-flight technique proposed is ready for measurements of epithermal neutron spectra. First experiments on neutron detection were performed. The count rate was measured as depending on the proton beam energy. Continuous neutron generation and spectrum measurement by time-of-flight technique are in short-range plans.

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Accelerator tube construction and characterization for a Tandem-Electrostatic-Quadrupole for Accelerator-Based Boron Neutron Capture Therapy

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Introduction: Within the frame of an ongoing project to develop a folded **T**andem-**E**lectro**s**tatic-**Q**uadrupole (**TESQ**) accelerator facility for Accelerator-Based Boron Neutron Capture Therapy (AB-BNCT) we discuss here the ongoing construction and characterization of the accelerator tubes for the transport and acceleration of 30mA proton or deuteron beam.

Materials and Methods: The tubes are essential components of the accelerator. Their function is to transport and accelerate an intense proton or deuteron beam (30mA) through the machine, from the ion source to the neutron production target, without significant losses. In this contribution we discuss the materials selected for the tube construction, the procedures used for their assembly and the testing performed to meet the stringent requirements to which it is subjected. The tubes have to withstand non-negligible mechanical stresses, they have to be completely tight since they separate the ambient air from the high vacuum (less than 10^{-6} Torr) through which the beam is transported and the materials from which they are made of have to be appropriate for this high vacuum. In addition the tubes have to withstand the high electric fields necessary to focus and accelerate the beam

Results and Discussion: The present form of the tube prototype will be discussed in this presentation. It consists