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Measurement of the emittance of negative hydrogen ion beam injected into vacuum insulation tandem accelerator

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Neutron source for BNCT is currently operating in Novosibirsk, Russia. Generation of neutrons is carried out as a result of the reaction ^{7}Li(p, n)^{7}Be. To produce a proton beam, a vacuum insulation tandem accelerator is used. In the routine mode, a current of 1-3 mA is obtained, a maximum current of 5.3 mA is achieved [1]. To increase current to 10 mA, additional research is required. One of such studies is devoted to measuring of parameters of negative hydrogen ion beam, injected into the accelerator. A moving diaphragm made of tantalum with a hole of 1 mm in diameter was installed into the low-energy beam transportation path. The beam passing through the hole was measured by a wire scanner OWS-30 (D-Pace, Canada), located at a distance of 225 mm. The scanner makes it possible to measure the beam transverse profile in two coordinates with a high degree of detailing. Since moving diaphragm was moved along one of these coordinates, such a system from the scanner and the diaphragm made it possible to measure both the transverse and the azimuthal beam emittance. In this report the results of emittance measurements are presented and discussed, the obtained value of the normalized emittance is given, the presence of a spherical aberration of a magnetic focusing lens in the beam phase portrait is noted and solutions are proposed for improving the quality of the beam injected into the accelerator in order to increase the proton current.

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References

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