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Diagnostics of the high power proton beam in a tandem accelerator with vacuum insulation

Alexandr Makarov[1,2], Magomedrizy Atluhanov[1], Dmitrii Kasatov[1,2], Sergey Popov[1], Ivan Shchudlo[1,2], Sergey Taskaev[1,2]

[1] *Budker Institute of Nuclear Physics, 11 Lavrentiev ave., 630090 Novosibirsk, Russia*

[2] *Novosibirsk State University, 2 Pirogov str., 630090 Novosibirsk, Russia*

E-mail: alexxmak314@gmail.com

In a tandem accelerator with vacuum insulation a proton beam with 5 mA current and 2 MeV energy was obtained in a long steady mode [1]. The neutron flux generated in ^{7}Li(p,n)^{7}Be reaction is used for *in vivo* and *in vitro* BNCT studies [2], the therapeutic dose in these experiments is reached within an hour. The next stage is the further increase of the current up to 10 mA, energy up to 2.3 MeV and transition to clinical trials. The most important practical task to be solved before is to ensure high reliability of the accelerator in the daily neutron generation mode with high proton current. For this purpose the accelerator is being modernized, including: 1) installation of 3 moving cooled Faraday cups with 9 thermoresistors in each to measure the total current and the position of the proton beam; 2) installation of non-contact current sensors manufactured by Bergoz Instr. (France); 3) development of non-destructive optical diagnostics of the beam profile and position based on the luminescence of a gas ionized by a proton beam, 4) installation of cooled copper diaphragms with 4 thermoresistors in each for monitoring and limiting beam deflection. Next year it is planned to install a new bending magnet with a straight-through channel, which will allow measuring of neutral particles flux and also continuous monitoring of the lithium layer temperature. This work presents and discusses the details of the diagnostics being developed, as well as the results of the application of cooled diaphragms.

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References

1. A. Ivanov et al. Obtaining a proton beam with 5-mA current in a tandem accelerator with vacuum insulation. Tech. Phys. Lett. 42, 608 (2016).
2. A. Zaboronok et al. Boron-neutron capture therapy in Russia: preclinical evaluation of efficacy and perspectives of its application in neurooncology. New Armenian Medical Journal, 11, 6 (2017).