# POSITRON SOURCE FOR THE LEPTA PROJECT

V. Bykovskiy, A. Ivanov, A. Kobets, N. Korolev, Yu. Korotaev, I. Meshkov, V. Pavlov, R.Pivin, A. Sidorin, A. Smirnov, E. Syresin, G. Trubnikov, V.Shmarovoz, S. Yakovenko, JINR, Dubna,Russia

*Abstract*

The positron injector is being tested for the Low Energy Positron Toroidal Accumulator (LEPTA) constructed at JINR [1] The injector has to generate positrons of energy of 10 keV at relative energy spread of $2\cdot10^{-3}$, intensity of $10^8$ -$10^9$ particles per pulse. The injection pulse duration up to 300 nsec and injection repetition is about 100 sec.

## THE POSITRON INJECTOR

The positron injector (see Fig.1) [2] consists of a positron for-injector, transportation channel, positron trap and channel of positron injection to the accumulator. All sections of the injector are accommodated into longitudinal magnetic field. The positrons are emitted by the $\beta^+$ - active isotope of $^{22}$Na, and moderated to the energy less then 1 eV inside the for-injector. Slowed positrons passing through the transportation channel are separated from the fast one. Further, slow positrons are got in positron trap were they are accumulated for 100 sec. After accumulation positron bunch is extracted by pulsed electric field.

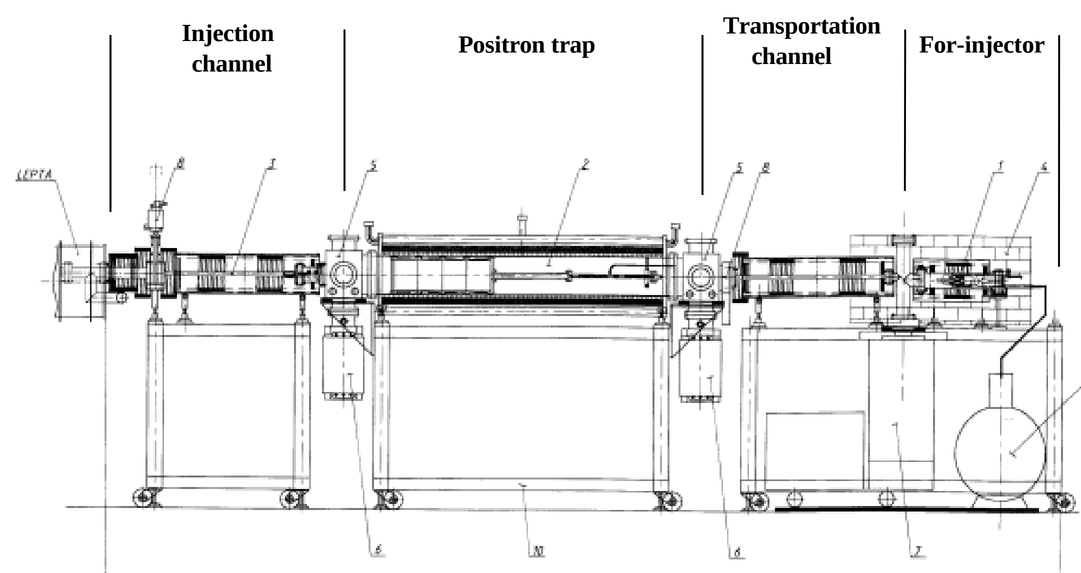


Figure1: Low energy positron injector. 1 – positron source assembly, 2 – positron trap, 3 -injection chanel, 4 – bead protection, 5 – assembly of positron source, 6 – ion-pump, 7 – turbo-pump, 8 – valve, 9 – Dewar wessel, 10 – stand.

## FOR-INJECTOR

For-injector is used to provide a continuos beam of slow positrons. There is an assembly of positron source inside the vacuum chamber of the for-injector (see fig.2) where continuos flux of the slow positrons is formed. The radioactive isotope $^{22}$Na tablet is placed on copper substrate (1) inside a copper cylinder (2). The cylinder ended by the copper cone (3). Solid neon, frozen on the surface of the cone, serves as moderator for flying positrons. First cryogenic heat exchanger (4) inheres on the surface of the cylinder. A liquid helium flowing through the heater cools down cylinder and cone to the temperature less then 5 K. The copper cylinder is located inside of the copper cover (5) used for heat and radiation protection of the internal system. On the outer surface of the cover second cryogenic heat exchanger is disposed (6). The liquid helium has passed through cylinder's heat exchanger leaves system through copper cover's one. On the other side neon falls into the system through second heat exchanger where preliminary cooled. Then it is injected on internal surface of the copper cone by nozzles (7). Such design is original and allows checking thickness of the frozen moderator.

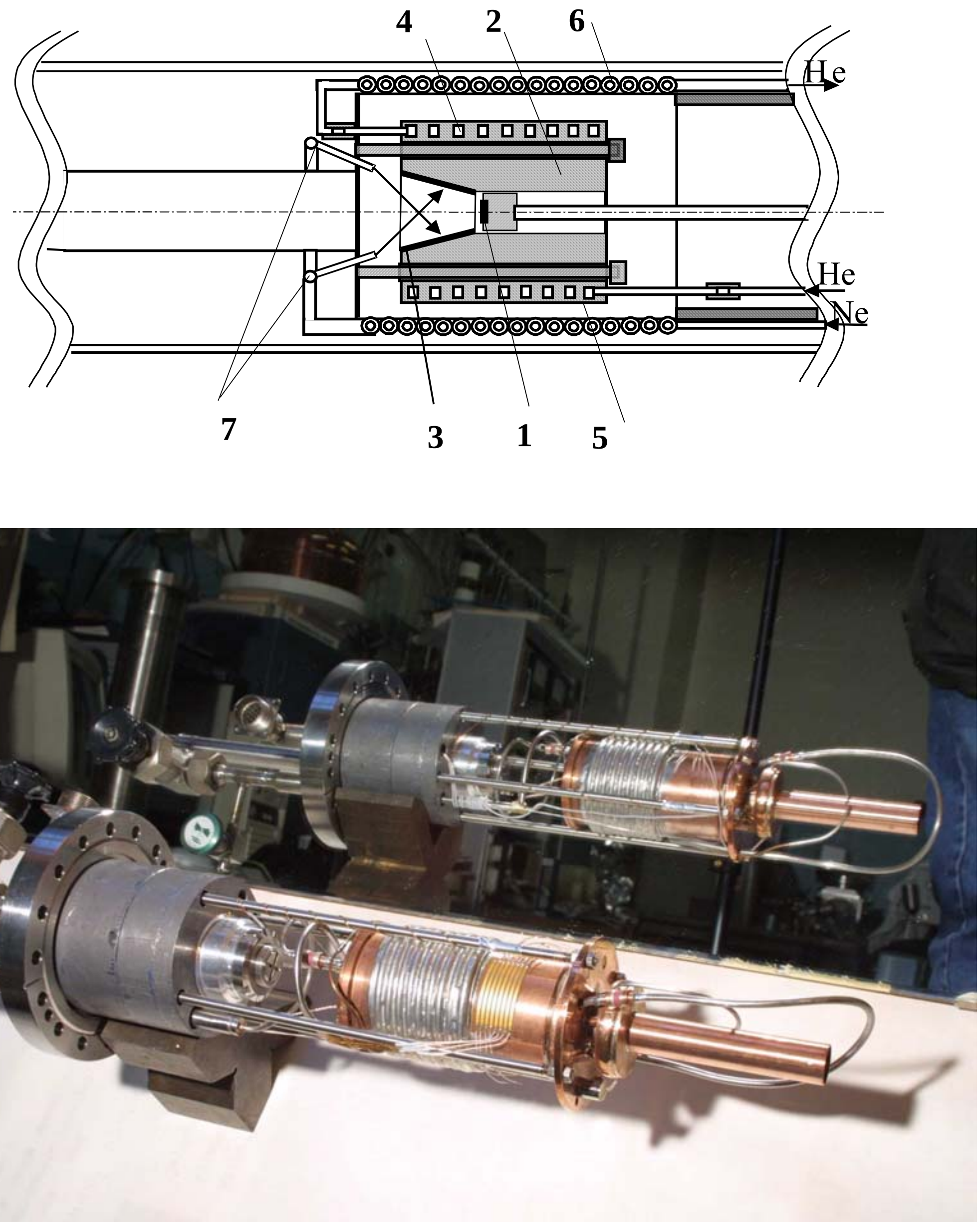


Figure 2: Positron source assembly

## STATUS

The main elements of the injector have been manufactured. The vacuum chamber, electrodes and solenoid of the trap have been manufactured. The vacuum posts are under fabrication. The vacuum chamber and assembly of positron source of the for-injector have been manufactured. The magnetic coils of the transportation channel and channel of positron injection are under construction. The test emitter of positrons with activity of 0.8 MBk has been manufactured. It has been fixed in the assembly of positron source. The for-injector test bench has been assembled

The micro channel plates (see fig.3) have detected the first positron.

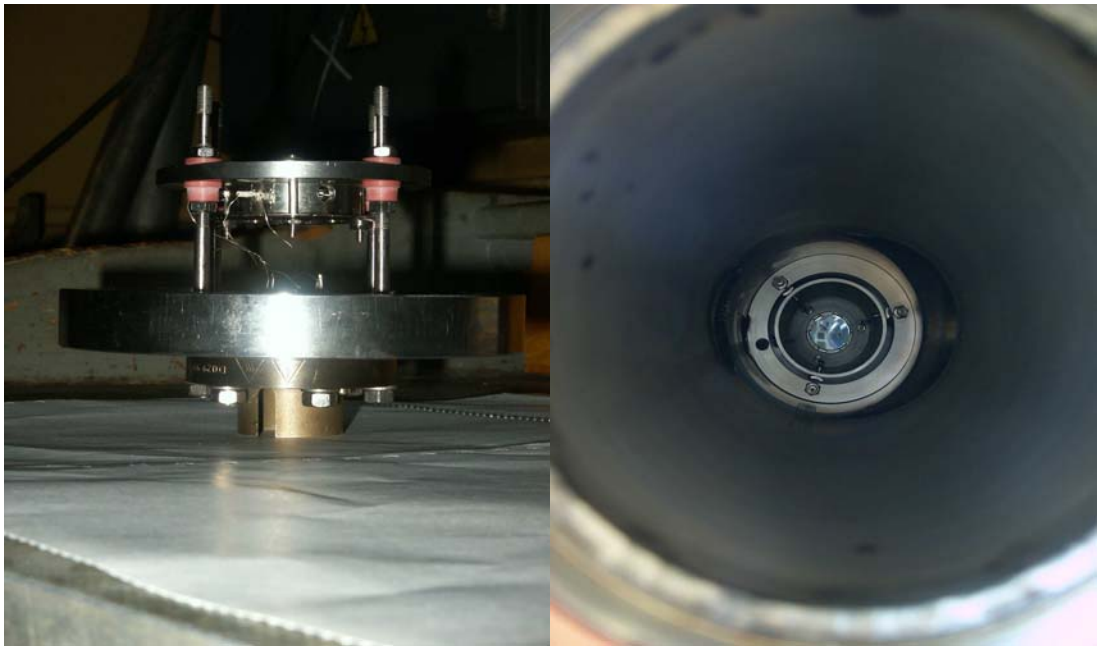

Figure 3: MCP detector

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## REFERENCES

[1] V.Antropov et al. “Positron storage ring LEPTA”, Nim A532 (2004) pp. 172-176

[2] V. Antropov. et al. “Injector of low energy positrons”, Atomic energy,2003,Vol.94, pp.68-70