TWO-STAGE VACUUM PUMPING SYSTEM BASED ON TITANIUM ARC EVAPORATORS FOR 3.5 mw NeUtral beam INJECTOR

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A system of fast vacuum pumping of the injector beamline based on the titanium arc evaporators is designed and manufactured for a powerful beam injector. The energy of the beam particles is 40 keV, the beam power in the extracted ions is 5 MW, power in atoms is 3.5 MW. The high power of the beam causes a significant gas release on the residual ions dump and on the elements of the beam duct, which can lead to an increase in the reionization losses of the beam. Therefore, it is important to ensure a high speed pumping in the beamline, especially after the deflecting magnet and in the region of the deflected ions dump.

The first stage of pumping in the area between the neutralizer and the bending magnet is provided by 4 rod evaporators of titanium located parallel to the beam axis. The sorption panel of the first stage is a copper cylindrical surface with a diameter of about 1 meter with finned inner surface and the possibility of cooling to the temperature of liquid nitrogen [1].

The second stage of pumping takes part of the vacuum chamber between the magnet and the output port of the beam and has an annular titanium evaporator. Sorption panels are made of aluminum profile with ribbed surface.

The MolFlow program was used to calculate the gas distribution along the beamline [2]. The total reionization losses of the beam at two-stage pumping are reduced to 5% compared to 26% at pumping by the first stage only.

References

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