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Ion Acceleration in a Compact Helicon Source with Various Permanent Magnet Configurations KONSTANTIN SHAMRAI, VALERY VIRKO, YURY VIRKO, Institute for Nuclear Research, NAS of Ukraine, Kiev 03680, Ukraine — The parameters of plasma and emergent ion beam were examined in a 4.5-cm-diam compact helicon source excited by a double-turn $m = 0$ antenna and equipped with a multi-component permanent magnet system. The basic magnetic configuration was formed by a radially magnetized cylindrical assembly of the ferrite bars. It could be enhanced by an axially magnetized annular ferrite that was installed near the source outlet to create the magnetic nozzle. The magnetic configuration was found to be a crucial point for production of accelerated ions. At Ar pressure below 1 mTorr and rf power of 600 W, plasma potential in the discharge chamber was 100-120 V, which is by 50-60 V higher than in the drift chamber, but the emergent beam of accelerated ions arose only in the presence of the magnetic nozzle. This implies that electrostatics might not be the only driver for ion acceleration. The beam of accelerated ions had energies up to 120 eV, relative to ground, and the current up to 40 mA, whereas the electron temperature in the discharge chamber was 10-12 eV. The source parameters were optimized by installing various ferrite assemblies and the outlet ferrite shield, and also by testing various driving antennas and frequencies.

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