

Investigations of plasma parameters and features of compression zone formation in MPC facility using the optical and spectroscopic methods of diagnostics

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The investigations of dense compressive plasma streams, generated by magnetoplasma compressors (MPC), are the important fundamental and application problem [1]. MPC-device which situated in Kharkov (Ukraine) was developed and constructed as source of intensive electromagnetic and corpuscular radiation pulses, and able successfully work at gases with different masses so as with their mixes.

The main attention focused at the studying of the formation and dynamics of the compression zone so as plasma stream characteristics, using optical and spectroscopic diagnostics. In particular, the time of originating and existences of this zone was analyzed, so as the temporal behavior of plasma electron density and other important parameters and characteristics.

Argon was used as the working gas. Several series of experiments with different initial (residual) gas pressure in vacuum chamber were carried out for receiving the optimal plasma parameters. Experiments were carried out in MPC [2] with discharge current of 380 kA and working voltage 20 kV.

In present investigations temporal and spatial distributions of plasma density were measured in plasma stream and compression region for different initial conditions. Quadratic Stark broadening of corresponding spectral lines of argon were used for plasma density calculations. Stark broadening was estimated from full experimental widths taking into account instrumental and Doppler broadening [3, 4]. Plasma dynamics parameters and their distributions were also discussed.

References

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