Turbulent Fluctuations of Plasma Injected in Open Magnetic Trap from Independent UHF Source

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The stationary open magnetic trap – linear plasma device – OMT-2 functions in our laboratory. We investigate on this device the methods of plasma heating by electromagnetic waves, interaction of electromagnetic waves with magnetoactive plasma and plasma turbulence and transport processes in the trap (trap length 90 cm, magnetic field strength 0 ÷ 5000 Oe).

We use ultra-high frequency (UHF) contactless method to fill the open magnetic trap by plasma. Generally, this method is used quite often, but in most cases plasma formation takes place in the trap itself in electron cyclotron resonance (ECR) regime. This method has several drawbacks – range of magnetic field variation in the trap is strictly limited by the existence of UHF discharge in the magnetic field and "hot" region of UHF wave absorption in plasma is in the trap itself. The latter does not allow to investigate in detail many fine effects – interaction of electromagnetic waves with plasma, transition of this interaction from linear to nonlinear regime, plasma turbulence and transport processes in the trap etc. For this reason we have proposed different method of open magnetic trap filling with plasma – plasma is injected in the trap along the magnetic field from independent stationary UHF source. The source is located outside the trap (axial separation of UHF source from the trap varies within 20 ÷ 40 cm range) and plasma formation in it takes place in strongly non-uniform magnetic field, in ECR regime by means of the UHF generator (2400 MHz, 150 W).

We present the main physical characteristics of plasma accumulated in the trap, but mainly concentrate on investigation of plasma turbulent fluctuations. This investigation is carried out in different experimental conditions by means of 8 Langmuir probes. The probes are installed along the discharge chamber axis with axial separation 75 mm and cover the region from independent UHF plasma source till the center of the trap. We present the distribution of floating potential and its turbulent characteristics along the discharge chamber. Namely, spectral and statistical characteristics are investigated in different discharge regimes.