Publ. Astron. Obs. Belgrade No. 103 (2024), 119 *Poster*
https://doi.org/10.69646/aob103p119

IONIZATION OF A PLASMA ANTENNA CHANNEL IN A DIELECTRIC GAS-DISCHARGE TUBE

N.N. BOGACHEV, I.L. BOGDANKEVICH, V.I. ZHUKOV,
D.M. KARFIDOV, V.P. STEPIN and N.G. GUSEIN-ZADE

Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia
E-mail bgniknik@yandex.ru

Abstract. Plasma antennas are a pressing topic for research at the intersection of gas discharge, plasma physics and antenna engineering. The most popular type of plasma antennas are those made from gas-discharge tubes with ionization by a surface electromagnetic wave. Many studies have been generated on the performance of various configurations of such plasma antennas. There are also many works on the study of the parameters and characteristics of discharges on a surface wave. An important fundamental task in the study of a plasma asymmetrical dipole antenna with a gas-discharge tube is the construction of a physical model and a description of the processes occurring in it and affecting its operation.

In this work, the process of the formation of a plasma antenna channel was studied using numerical simulation. Numerical simulations were carried out in the electromagnetic code KARAT, see Tarakanov V.P. 1992, using the finite difference time domain method for calculating the electromagnetic field and the Particle-in-Cell method for plasma. In 2.5D geometry, a model of a plasma asymmetric dipole antenna was created from a glass tube filled with argon with low local preionization, a metal screen and a coaxial cable (without using a surfatron). For argon pressures in the range from 0.1 Torr to 1 Torr, a stationary discharge mode was achieved, the discharge rates were determined, the distributions of electrons, ions and current in the plasma, the field distributions inside the gas discharge tube and in the near zone were obtained, and the antenna radiation patterns were calculated. The obtained discharge rates correspond to known theoretical estimates and experimental data.

References

Tarakanov V.P., User's manual for code KARAT, *Springfield: BRA* (1992)