Radiation of FM-signal by plasma asymmetrical dipole antenna

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The actual problem of the development of plasma antennas is a study of the signal radiation. Previously, we had investigated the spectra of the non-modulated signal, which had been radiated by plasma asymmetrical dipole antenna. Amplitudes at multiple frequencies of the input non-modulated signal frequency had been amplified by plasma antenna. In this work, we have experimentally studied the radiation of a frequency modulated signal (FM signal) by plasma asymmetric dipole antenna. We have obtained spectra of the FM signal, which have been radiated by plasma antenna and by same metal antenna. These spectra were compared to each other for analysis of signal nonlinear distortions. Discovered distortions of radiated FM signal from plasma antenna are inappreciable.

Plasma antenna is type of antennas, in which plasma is used as waveguide, radiated or control element [1-7]. Studies of plasma antennas aim to solving problems of modern radio engineering, such as the invention of intelligent antennas with fast reconfigurable antenna characteristics; radar visibility decrease of the antenna devices of military objects and equipment; the security improving of radio systems from the effects of electronic warfare and destruction by atmospheric electrical discharges.

The plasma antenna can be divided into several classes: plasma antenna of discharge tubes; solid-state plasma (silicon) antenna (PSiAn); jet plasma antenna and others. The biggest and most promising class is plasma antennas of the discharge tubes. In this paper we study the plasma asymmetrical dipole antenna (PADA) to the discharge tube [1-7]. One is much the same as a metal asymmetrical dipole antenna (MADA), and consists of a rod (dipole arm), which connect to the central conductor of the coaxial cable, and a conductive disk (screen), which connect to the outer conductor of the coaxial cable. In the case of a plasma antenna metal rod is replaced by a gas discharge tube with plasma. The optimal length of antenna arm is considered quarter wave $l_a=\lambda/4$.

In [7] we had investigated the spectra of the non-modulated signal, which had been radiated by plasma asymmetrical dipole antenna. Amplitudes at multiple frequencies of the input signal frequency had been amplified by plasma antenna.

In this work, we have experimentally studied the radiation of a frequency modulated signal (FM signal) by plasma asymmetric dipole antenna. The experimental setup scheme of FM signal spectra measurements is presented on fig. 1. Modulating signal go from the message source (1) to the broadcast set VX-2100 (2). FM modulated signal from (2) go to the plasma or metal antenna (4) situated on the positioner (3). The plasma or metal antenna radiates signal and the measure antenna (5) receives signal. Amplitude spectrum of FM signal is shown on the screen of spectrum analyzer Agilent PXA N 9030A (6).

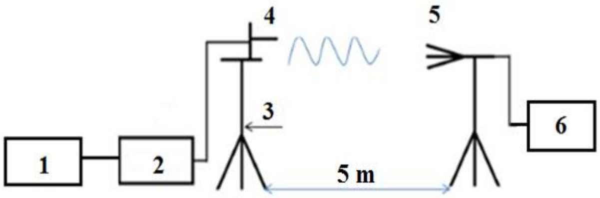

Fig 1. Scheme of the experimental setup.

We have obtained spectra of the FM signal, which have been radiated by plasma antenna and by same metal antenna. These spectra were compared to each other for analysis of signal nonlinear distortions. Discovered distortions of radiated FM signal from plasma antenna are inappreciable.

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