INFLUENCE OF PLASMA NONSTATIONARITY ON SPECTRUM AND SHAPE OF MICROWAVE PULSE OF PLASMA RELATIVISTIC MICROWAVE AMPLIFIER

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Change of the microwave pulse shape of the plasma relativistic microwave amplifier depending on an initial electron density of the plasma created in system is experimentally detected. Depending on the plasma density are possible: fast break of amplification, stable operation of the amplifier during a current pulse of the relativistic electron beam and its late turning on. Decrease of the frequency of an output signal in comparison with magnetron frequency is experimentally detected. Change of the microwave pulse shape of a signal and decrease in its frequency is explained by decrease of plasma density in plasma microwave amplifier. Change of plasma density leads to change of phase velocity of the amplified wave that creates variable phase progression in time on the exit of a plasma waveguide and radiation frequency shift. The various microwave shapes of a signal of plasma microwave amplifier are explained by the change of an amplification coefficient caused by decrease in an electron density of plasma. By the experimental data on the basis of the linear theory of amplification in plasma relativistic microwave amplifier with thin-walled tubular electron beam and plasma is qualitatively determined dynamics of change of plasma density during a current pulse of relativistic electron beam. The experimental results and their theoretical explanation are confirmed by the direct numerical simulation by using PiC code KARAT.