possibilities of creating a broadband plasma relativistic noise amplifier and its transitioning to the generation mode

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Plasma relativistic microwave amplifiers (PRMA) are a unique class of devices - plasma masers based on the generation of microwave radiation as a result of the interaction of a tubular high-current relativistic beam with a tubular plasma. A distinctive feature of plasma masers is the possibility of tuning the average radiation frequency in a wide frequency range.

The design of a PRMA with inverse geometry was chosen, which was previously used in several works. Such setup is convenient for constructing microwave amplifiers operating in the frequency mode, since it is much easier to provide cooling of the collector in them. The second advantage of this geometry is the possibility to use of large REB currents, whereas in classical geometry with REB located inside the plasma, you can use no more than 20–30% of the amount of current that the accelerator can provide. In [1, 2], it was shown that inverse geometry can be used to construct a PRMA with high efficiency. It can operate in a frequency-periodic or frequency mode. The work is a continuation of [2], in which the concept of building a noise amplifier was proposed.

The purpose of this work is to demonstrate the possibility of building a noise amplifier in geometry with inverse geometry due to breaking the feedback, comparing the obtained data with the amplifiers with feedback. We use of a short pulse duration of REB 4 ns to break the feedback in the numerical experiment. The transition from the generation mode with feedback to the generation mode without feedback will be shown. It will allow one to find the optimal parameters of the future experimental setup.

References

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